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ABSTRACT

Project Impact, a support system for the administrative and instructional staff in the Onondaga-Madison BOCES schools, was designed to support a diagnostic-prescriptive approach in the classroom by providing the information the teacher needs in order to make instructional decisions. It consists of a series of computer programs with a large storage bank of data to assist school personnel in curriculum development, validation and dissemination, standardized achievement testing, criterion referenced testing, student achievement data analysis, long term storage and retrieval of student test data, and the identification and reporting of students in categorically aided programs, as well as those in need of remediation. The efficacy of this instructional management information system on student learning has been substantiated through a systematic evaluation of its implementation in 45 classrooms that served as an initial systems pilot test. (Author/MER)

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PROJECT IMPACT: A COMPUTER-BASED STUDENT ACHIEVEMENT INFORMATION SYSTEM

PAPER PRESENTATION

SIG/SYSTEMS RESEARCH

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APRIL 1981

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A B S T R A C T

"Teacher Reaction to the Use of a Diagnostic Prescriptive Approach to Classroom Instruction Employing a Data Automated Student Achievement Information Support System:

RUTH HOWLAND, Onondaga-Madison BOCES

Project IMPACT is an instructional management system which uses current computer technology. It has been planned, designed, developed and implemented in the Central New York Region with an ESEA Title IV-C grant and New York State special purpose monies. The system has been designed to support a diagnostic-prescriptive approach to instruction in the classroom by providing the type and scope of information that the teacher needs in order to make instructional decisions. This report focuses on teacher reaction to the utilization of this newly developed system.

A B S T R A C T

The Effect Of A Student Achievement Information System On Student Learning

CHARLES F. ADAMS, Onondaga-Madison BOCES

Use of a computer technology to provide systematic feedback information to classroom teachers has potential for enhancing instructional decision making and thus increased student achievement. The efficacy of the IMPACT instructional management information system on student learning has been substantiated as a result of a systematic evaluation of its implementation over a two year period. This tentative conclusion is based upon student data obtained from fourty-five classrooms that served as an initial system pilot test.

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OVERVIEW OF THE IMPACT SYSTEM

THE IMPACT SYSTEM IS A SUPPORT SYSTEM FOR THE ADMINISTRATIVE AND INSTRUCTIONAL STAFF IN THE SCHOOL. IT PLACES THE ADVANTAGES OF TECHNOLOGY--SPEED AND COST EFFECTIVENESS AT THE DISPOSAL OF EDUCATORS IN NEW YORK STATE.

THE SYSTEM HAS BEEN UNDER DEVELOPMENT AND PILOT TESTING BY THE STAFF OF THE ONONDAGA-MADISON BOARD OF COOPERATIVE EDUCATIONAL SERVICES (ONONDAGA-MADISON BOCES) FOR THE PAST FOUR YEARS. THIS WORK HAS BEEN SUPPORTED BY A TITLE IV-C GRANT. DEVELOPMENT WILL BE COMPLETED THIS JUNE, AND THE PROJECT SUBMITTED FOR TITLE IV-C VALIDATION AND EVENTUAL REPLICATION BY THE OTHER BOCES COMPUTER CENTERS IN NEW YORK STATE.

IMPACT IS A SERIES OF COMPUTER PROGRAMS AND A LARGE STORAGE BANK OF DATA TO ASSIST LOCAL SCHOOL PERSONNELL IN THE FOLLOWING TASKS

A. CURRICULUM DEVELOPMENT, VALIDATION AND DISSEMINATION

B. STANDARDIZED ACHIEVEMENT TESTING

C. CRITERION REFERENCED TESTING

D. STUDENT ACHIEVEMENT DATA ANALYSIS

E. LONG TERM STORAGE AND RETRIEVAL OF STUDENT TEST DATA

F. IDENTIFICATION AND REPORTING OF STUDENTS IN CATEGORICALLY AIDED PROGRAMS AS WELL AS THOSE STUDENTS IN NEED OF REMEDIATION AS INDICATED BY THE ADMINISTRATION OF NYS REQUIRED TESTS.

THE IMPACT SYSTEM IS DIVIDED INTO FOUR MAJOR COMPONENTS EACH MAKING ITS OWN CONTRIBUTION TO THE DATA STORAGE AND ANALYSIS NEEDS OF A VARIETY OF USERS IN THE EDUCATION COMMUNITY. THESE COMPONENTS ARE

A. THE MASTER CURRICULUM FILE--A LIBRARY OF INSTRUCTIONAL OBJECTIVES, CRITERION REFERENCED MEASUREMENT ITEMS, AND TEACHING-LEARNING ACTIVITIES.

B. THE NORM REFERENCED TEST SCORING COMPONENT--A SERIES OF COMPUTER PROGRAMS DESIGNED TO SCORE ANY OF THE VARIOUS STANDARDIZED TESTS AND NYS ED. DEPT. TESTS CURRENTLY IN USE IN THE FIELD.

C. THE CRITERION REFERENCED TEST SCORING COMPONENT--A SERIES OF COMPUTER PROGRAMS DESIGNED TO ASSIST SCHOOL PERSONNELL IN THE DEVELOPMENT AND MONITORING OF CRITERION REFERENCED INSTRUCTIONAL COURSES.

D. THE STUDENT ACHIEVEMENT HISTORICAL FILE COMPONENT STORES THE VARIETY OF STUDENT ACHIEVEMENT INFORMATION ACCUMULATED BY A STUDENT DURING HIS/HER SCHOOL CAREER.

THIS DATA IS THEN READILY AVAILABLE FOR A VARIETY OF PURPOSES BY AN ASSORTMENT OF SCHOOL PERSONNELL. PERHAPS THE MOST FREQUENT USE OF THE HISTORY FILE AND ITS RELATED COMPUTER PROGRAMS WILL BE THE CREATION OF RECORDS REQUIRED BY THE STATE ED. DEPARTMENT FOR CHILDREN IN CATEGORICALLY AIDED STATE AND FEDERAL PROGRAMS.

A SYMPOSIUM PRESENTED AT LAST YEAR'S AERA CONVENTION IN BOSTON BY DR. CHARLES F. ADAMS, DR. FRANK AMBROSIE, AND MR. JAMES R. CRANER DETAILS THE HISTORY, EFFECT AND FUNCTIONING OF THE IMPACT SYSTEM. IT IS AVAILABLE FROM DR. CHARLES F. ADAMS, 6820 THOMPSON RD., SYRACUSE, NEW YORK, 13212. THE PAPER, ETITILED

PROJECT IMPACT A COMPUTER BASED INSTRUCTIONAL MANAGEMENT INFORMATION SYSTEM

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THE IMPACT MASTER CURRICULUM FILE -- OVERVIEW

THE REMAINDER OF THIS PAPER WILL DEAL WITH THE USE OF THE MCF TO STORE, RETRIEVE, VALIDATE AND DISSEMINATE INSTRUCTIONAL OBJECTIVES, MEASUREMENT ITEMS, AND TEACHING STRATEGIES. THE USER MAY RETRIEVE THESE ELEMENTS EITHER IN THE FORM OF PRINTED COPY, COMPUTER OUTPUT MICROFICHE (COM), OR ON-LINE WITH 3270 TYPE COMPUTER TERMINALS CONNECTED TO THE HOST COMPUTER AT THE BOCES CENTRAL NEW YORK REGIONAL COMPUTER CENTER. IN ADDITION, THE ENTIRE MCF MAY BE TRANSPORTED TO OTHER NEW YORK STATE BOCES COMPUTER CENTERS DURING THE REPLICATION OF THE IMPACT SYSTEM ON COMPUTER MAGNETIC TAPE.

IN ADDITION TO ITS USE AS A CURRICULUM LIBRARY, THE MCF SERVES AS A TOOL OF THE CURRICULUM EVALUATOR. CONTAINED IN THE BANKS OF THE MCF ARE RECORDS OF THE USE OF EACH CURRICULUM ELEMENT AND DATA RELATING TO THE EFFECTIVENESS OF THAT USE. THUS THE CURRICULUM EVALUATOR CAN SEE WHETHER THE USE OF AN OBJECTIVE, MEASUREMENT ITEM, OR TEACHING PRESCRIPTION IS HAVING ANY APPARENT EFFECT ON THE STUDENT POPULATION.

FOR EACH OBJECTIVE IS STORED THE NUMBERS OF MASTERS AND NONMASTERS IN BOTH PRE AND POST TESTING MODALITIES. THIS INFORMATION COMES FROM CRT COMPONENT OF THE IMPACT SYSTEM DURING THE DAILY PROCESSING OF CRT TESTS.

FOR EACH MEASUREMENT ITEM IS STORED THE NUMBERS OF PRE AND POST-TEST MASTERS AND NONMASTERS OF THE ASSOCIATED OBJECTIVE WHO CHOSE EACH POSSIBLE RESPONSE TO THE ITEM STEM. THIS DATA IS ALSO CAPTURED DURING THE DAILY PROCESSING OF CRT TESTS AND TRANSFERRED TO THE MCF.

THE FOLLOWING IS AN EXAMPLE OF AN INSTRUCTIONAL OBJECTIVE CONTAINED IN THE IMPACT MASTER CURRICULUM FILE. THE HARDCOPY VERSION OF A CURRICULAR ELEMENT IS AVAILABLE EITHER ON STOCK NARROW COMPUTER PAPER, 5 X 8 INDEX CARD, OR PRE-PUNCHED NOTEBOOK SIZED PAPER, (COM) COMPUTER OUTPUT MICROFICHE, OR ON 3270 TYPE CRT EQUIPMENT CONNECTED TO THE HOST COMPUTER.

```
*************************************************************************
*                MASTER CURRICULUM FILE INQUIRY-OBJECTIVE               *
*                                                                       *
*  AREA-3000    READING AND LANGUAGE ARTS                               *
*                                                                       *
*  OBJECTIVE NUMBER 038530306       DICTIONARY GUIDE WORDS              *
*         CONCEPT - 08853                                               *
*        INST LVL - 03                                                  *
*         OBJ SEQ - 06                                                  *
*                                                    PRE      POST      *
*  STIMULUS -       03        NUMBER TESTED   - 000215  000431         *
*  RESPONSE -       05        NUMBER MASTERED - 000162  000385         *
*  STATUS           ACTIVE                                              *
*                                                                       *
*  LINE                      LINE TEXT                                  *
*                                                                       *
*  01 GIVEN AN ENTRY WORD AND TWO GUIDE WORDS, THE STUDENT              *
*  02 DESIGNATES WHETHER THE ENTRY WORD WOULD FALL BEFORE,              *
*  03 BETWEEN, OR AFTER THE GUIDE WORDS.                                *
*************************************************************************
```

THE IMPACT CURRICULUM CODING SCHEME

IN ORDER FOR CURRICULAR ELEMENTS TO BE STORED AND RETRIEVED VIA. COMPUTER, A NUMERIC CODING SCHEME FOR THE TEXTUAL ELEMENTS WAS NEEDED. THE IMPACT MCF BREAKS CURRICULUM DOWN INTO ** AREAS ** SUCH AS MATH AND READING WHICH ARE CODED AND DEFINED AS FOLLOWS

3000 READING AND LANGUAGE ARTS
4100 MATHEMATICS

AREA NUMBERS ARE FOUR DIGITS IN LENGTH. THE ORIGIN OF THE AREA NUMBERS ARE THE NEW YORK STATE BASIC EDUCATIONAL DATA SYSTEM CODES DESIGNED TO IDENTIFY INSTRUCTIONAL COURSES IN NEW YORK STATE. THIS BEDS NUMBERING SYSTEM WILL BE EXPLAINED IN MORE DETAIL BELOW.

WITHIN A CURRICULAR AREA, THE IMPACT MCF REALTES BOTH MEASUREMENT ITEMS AND TEACHING PRESCRIPTIONS TO AN ** OBJECTIVE **. THUS THE RELATIONAL NATURE OF THE MCF CURRICULAR ELEMENTS WOULD BE DIAGRAMMED AS FOLLOWS

THE 'BASIC EDUCATIONAL DATA SYSTEM' (BEDS) HAS DEVISED A CODING STRUCTURE WHICH CONTAINS, AMONG OTHER CODES, A FOUR DIGIT COURSE OF INSTRUCTION CODE. THIS CODE IS USED MOST OFTEN WHEN RELATING A TEACHER TO HIS OR HER INSTRUCTIONAL AREA.

THE IMPACT SYSTEM HAS ADOPTED THIS CODING STRUCTURE FOR THE PURPOSE OF IDENTIFYING THE CURRICULAR AREA TO WHICH A SPECIFIC LEARNING OBJECTIVE SHOULD BE ASSIGNED. THIS HAS BEEN ACCOMPLISHED BY UTILIZING THE FIRST ONE OR TWO DIGITS OF THE BEDS COURSE IDENTIFIER CODE AS THE AREA CODE FOR OBJECTIVES IN THAT PARTICULAR INSTRUCTIONAL AREA. THIS HAS BEEN SHOWN TO PRODUCE A CODE SYSTEM WHICH CAUSES LITTLE NEEDLESS DUPLICATION AND WHICH UTILIZES AN ALREADY EXISTING CODIDNG SCHEME WHICH HAS BEEN ADOPTED AS A STATEWIDE STANDARD.

THE IMPACT CURRICULUM CODING SCHEME CONT.

FOR EXAMPLE, THE MASTER CURRICULUM FILE AREA 3000 HAS BEEN SET ASIDE FOR OBJECTIVES IN THE 'READING AND LANGUAGE ARTS' AREA. AREA 3000 CONTAINS OBJECTIVES WHICH WOULD BE USED IN THE PROCESS OF CREATING INSTRUCTIONAL COURSES SUCH AS THE FOLLOWING.

BEDS CODE	COURSE DESCRIPTOR	BEDS CODE	COURSE DESCRIPTOR
3012	DEVELOPMENTAL READING	3148	FICTION
3014	CORRECTIVE READING	3162	JOURNALISM
3016	REMEDIAL READING	3176	SPORTS IN LITERATURE
3112	4TH GRADE ENGLISH	3130	COMPOSITION

THE SPECIFIC AREA NUMBERS ASSIGNED TO SOME OTHER CURRICULAR AREAS ARE LISTED BELOW. OTHERS CAN BE ADDED TO THE MCF AS NEEDED.

2000 SPECIAL EDUCATION
3000 READING AND LANGUAGE ARTS
3300 FRENCH
3400 SPANISH
4100 MATHEMATICS
4200 SCIENCE
4300 SOCIAL STUDIES
5100 INDUSTRIAL ARTS
4500 HEALTH EDUCATION
5700 SAFETY EDUCATION

THE OBJECTIVES IN THE MASTER CURRICULUM FILE ARE CODED WITH A PLANNED STRUCTURE IN ORDER TO GIVE THE USER AN ORGANIZED APPROACH WHEN SEARCHING THE FILES AND STRUCTURING COURSE CURRICULUM. READING AND LANGUAGE ARTS ARE COMPOSED OF A VARIETY OF SKILLS AND CONCEPTS WHICH, WHEN STRUCTURED, FORM A HIERARACHY OF SKILL DEVELOPMENT. ON THE OTHER HAND, THE CONTENT AREA SUBJECTS LEND THEMSELVES TO A TOPICAL STRUCTURE BASED ON THE CONTENT OF THE SUBJECT AREA. HOWEVER, WITHIN THESE TOPICS, THERE ARE SUB-TOPICS, SKILL APPLICATIONS AND A HIERARCHY OF THINKING RELATIVE TO THE TOPIC UNDER STUDY.

EACH OBJECTIVE IN THE IMPACT SYSTEM IS ASSIGNED A 9-DIGIT OBJECTIVE NUMBER. THIS NUMBER IS COMPOSED OF THE FOLLOWING SUB-ELEMENTS.

CONCEPT - 5 DIGITS
LEVEL - 2 DIGITS
UNIQUE NO. - 2 DIGITS

IN THE SECTION WHICH FOLLOWS, THE STRUCTURE OF THE IMPACT CONCEPT NUMBERS IN READING AND LANGUAGE ARTS WILL BE DESCRIBED. THESE CONCEPT NUMBERS AND THEIR VERBAL DESCRIPTORS WERE CREATED BY MS. RUTH HOWLAND OF THE PROJECT STAFF.

THE READING SKILLS FOR PROJECT IMPACT ARE DEFINED BY THE PLACEMENT OF DIGITS FROM LEFT TO RIGHT. EACH OBJECTIVE ON FILE IS COMPOSED OF NINE DIGITS. THE FIRST FIVE DIGITS MAKE UP THE CONCEPT NUMBER WHICH DEFINES THE MAJOR SKILL, CONCEPT OR TOPIC UPON WHICH THE OBJECTIVE IS FOCUSING.

THE IMPACT CURRICULUM CODING SCHEME CONT.

THE NEXT TWO DIGITS DEFINE THE LEVEL AT WHICH THE OBJECTIVE IS AIMED. THE LAST TWO DIGITS OF THE OBJECTIVE NUMBER DEFINE THE UNIQUE OBJECTIVE THAT FALLS WITHIN A CONCEPT AREA AT A GIVEN LEVEL.

CONCEPT NUMBER	INSTRUC. LEVEL	UNIQUE OBJECTIVE
0 3 3 4 1	0 2	14
- - - - -	- -	- -

BECAUSE THE AREA, READING AND LANGUAGE ARTS, HAS BEEN STRUCTURED TO DEFINE SKILLS RATHER THAN TOPICS, A SEPARATE EXPLANATION FOLLOWS FOR FOR READING/LANGAGE ARTS, MATH AND THE CONTENT AREAS.

CONCEPT NUMBER READING/LANGUAGE ARTS

READING IS THE PROCESS THAT AN INDIVIDUAL USES TO OBTAIN MEANING FROM PRINT. IT IS NOT ALWAYS POSSIBLE TO KNOW WHAT SKILLS OR COMBINATION OF SKILLS ARE BEING USED IN THIS COMPLEX PROCESS. THEREFORE, EDUCATORS HAVE APPROACHED THE TEACHING OF READING BY FOCUSING ON THOSE SKILLS WHICH A STUDENT IS LIKELY TO NEED AND UTILIZE.

READING SKILLS ARE DEVELOPMENTAL IN NATURE. SKILLS REQUIRED FOR READING BEGIN AT THE READINESS LEVEL BEFORE A CHILD ENTERS SCHOOL, DEVELOP AND EXPAND TO THOSE APPLICATIONS THAT ARE EVENTUALLY USED IN DAILY LIVING, ACADEMIC PURSUITS AND ADULT CAREERS. SKILLS CAN BE TAUGHT AT MANY LEVELS WITH DIFFERENT LEVELS OF SOPHISTICATION. FOR EXAMPLE THE SUFFIX 'S' ADDED TO 'CAT' TO FORM 'CATS' IS THE SAME SKILL FOCUS AS FORMING THE WORD 'TONSILITIS' BY AFFIXING 'ITIS' TO THE WORD 'TONSIL'. HOWEVER, THE LEVEL OF SOPHISTICATION THAT IS REQUIRED BY THE STUDENT PLACES THESE TWO KINDS OF OBJECTIVES AT DIFFERENT INSTRUCTIONAL LEVELS. IN ADDITION, WE DO NOT KNOW WHETHER THE FIRST GRADE STUDENT READ THE WORD 'CATS' BY BLENDING THE SOUNDS TOGETHER, BY READING THE SIGHT WORD 'CAT' AND ADDING AN 'S' OR BY READING THE WORD 'CATS' IN ITS ENTIRETY AS A SIGHT WORD.

IN THOSE SITUATIONS WHERE A STUDENT IS HAVING DIFFICULTY LEARNING TO READ, WE MUST SEEK TO FIND THE COMBINATION OF SKILLS WHICH WILL WORK FOR HIM. THIS COMBINATION OF SKILLS MAY REQUIRE NOT ONLY ASCERTAINING HIS INSTRUCTIONAL LEVEL IN READING, BUT ALSO THE KIND OF STIMULI AND RESPONSES THAT SHOULD BE USED IN HIS INSTRUCTION, THE FORMAT OF THE INSTRUCTIONAL MATERIALS AND THE SETTING TO BE USED. THE IMPACT CODE PERMITS THE EDUCATOR TO STRUCTURE ALL OF THE ABOVE FACTORS THEREBY DELINEATING AN APPROPRIATE INSTRUCTIONAL PROGRAM FOR AN INDIVIDUAL STUDENT OR GROUPS OF STUDENTS.

THE ELEMENTS OF LANGUAGE WERE THE BASIS FOR STRUCTURING THE IMPACT READING/LANGUAGE ARTS CODE. BECAUSE IT IS BASED UPON LANGUAGE ELEMENTS, RATHER THAN THE SUBJECT AREA 'READING', IT CAN BE APPLIED TO ALL LANGUAGE ARTS AND PERHAPS TO FOREIGN LANGUAGES. IT IS POSSIBLE TO STRUCTURE WRITING, LISTENING AND SPEAKING SKILL CODES BY USING THE ELEMENTS IN THE READING MATRIX AND COMBINING THE RESULTING CONCEPT NUMBER WITH APPROPRIATE STIMULUS AND RESPONSE CODES.

THE IMPACT CURRICULUM CODING SCHEME CONT.

STRUCTURE OF THE READING CONCEPT NUMBER CODE THE FIRST DIGIT IS ALWAYS A ZERO (EXCEPT IN THOSE CASES WHERE A SPECIAL DESIGNATION HAS BEEN ASSIGNED TO THE FIRST DIGIT).THE READING MATRIX LISTED BELOW ENCOMPASES THE 2ND THROUGH 5TH DIGITS. THE 2ND, 3RD AND 4TH DIGITS DENOTE THE CONTEXT, FUNCTIONAL CONTENT AND THE CONCEPTUAL CONTENT IN THAT ORDER. THE FIFTH DIGIT IS A UNIQUE DESCRIPTER WHICH SERVES TO DEFINE SPECIFIC SKILL FOCUSES WHICH HAVE SIMILAR CHARACTERITICS. FOR EXAMPLE ROOT WORDS, PREFIXES, SUFFIXES AND COMPOUND WORDS ARE FOCUSING ON THE CONTEXT (WORD-3) IN THE SECOND DIGIT. THEY ALL FOCUS ON THE FUNCTIONAL CONTENT (STRUCTURE-4) IN THE THIRD DIGIT. IN THE FOURTH DIGIT, THEY ARE CONCERNED WITH (WHOLE/PART RELATIONSHIPS 4). THUS, ALL OF THESE SKILLS BEING WITH 0344 . AND SO, 3441 IS THE CONCEPT NUMBER FOR PREFIXES, 3442 IS SUFFIXES, 3443 IS ROOT WORDS AND 3445 IS COMPOUND WORDS.

IT IS IMPORTANT TO NOTE THAT THE AVERAGE USER OF THE MCF DOES NOT HAVE TO DEAL WITH THE CREATION OF THE CONCEPT NUMBERS. A TEACHER FOR EXAMPLE, UTILIZES AN ALREADY LIST OF CONCEPT NUMBERS AND DESCRIPTORS AND PROCEDES TO SEARCH THE FILE BY LISTING AND EXAMINING OBJECTIVES AT A CERTAIN INSTRUCTIONAL LEVEL AND WHICH ARE FOUND WITHIN A CONCEPT AREA.

THE IMPACT CURRICULUM CODING SCHEME CONT.

AT PRESENT, THE DIGIT "0" IS USED IN THE FIRST POSITION TO ALLOW FOR POSSIBLE FUTURE GROWTH IN THE CONCEPT NUMBER. THE OTHER DIGITS WERE ORIGINALLY ASSIGNED BY REFERENCING THE FOLLOWING TABLE.

SECOND DIGIT CONTEXT	THIRD DIGIT FUNCTIONAL CONTENT	FOURTH DIGIT CONCEPTUAL CONTENT	FIFTH DIGIT UNIQUE DESCRIPTORR
0 NOT USED	0 SOUND FOR CONSONANTS ONLY	0 NOT USED	0 NOT USED
1 NON-VERBAL LANGUAGE IN A PICTURE ENVIRONMENT SELF	1 BODY	1 ACTION REACTION	1 DESCRIPTOR
2 LETTER SYMBOLS SOUNDS	2 SIGHT	2 SPACE	2 DESCRIPTOR
3 WORD	3 SOUND	3 TIME	3 DESCRIPTOR
4 SENTENCE OR A SENTENCE PART SUCH AS A PHRASE OR CLAUSE	4 STRUCTURE	4 PART/WHOLE	4 DESCRIPTOR
5 SELECTION IN WRITTEN OR ORAL LANGUAGE	5 MEANING LITERAL	5 INFORMATION DESCRIPTION REPETITION CONSTANCY	5 DESCRIPTOR
6 BOOK	6 MEANING INTERPRETIVE	6 TRANSFORMATION CHANGE	6 DESCRIPTOR
7 LITERATURE	7 MEANING CRITICAL ANALYSIS	7 DISCRIMINATION	7 DESCRIPTOR
8 SYSTEM OF COMMUNICATION	8 ORGANIZATION	8 CLASSIFICATION	8 DESCRIPTOR
9 NOT USED	9 SOUND FOR VOWELS ONLY	9 ORDER	9 NOT USED

THE IMPACT CURRICULUM CODING SCHEME CONT.

THE LEVEL DESIGNATORS USED IN THE IMPACT READING AREA OF THE MCF WERE ORIGINALLY DEVELOPED BY THE PERSONNELL OF THE 'SYSTEM FOR PUPIL AND PROGRAM EVALUATION AND DEVELOPMENT (SPPED)' PROJECT AT NYS EDUCATION DEPARTMENT. THEY ARE INTERPRETED AS FOLLOWS.

LEVEL	MENTAL AGE	APPROXIMATE GRADE	DEVELOPMENTAL STAGE
1	4-6	K - BEGINNING 1	READINESS/EARLY LEARNING
2	6-9	1 - 3 (PRIMARY)	INTERMEDIATE LEARNING
3	9-12	4 - 6 (INTERMEDIATE)	ADVANCED LEARNING
4	12-14	7 - 8 (JR. HIGH)	EARLY APPLICATION
5	14-16	9 - 10 (HIGH SCHOOL)	INTERMEDIATE APPLICATION
6	16	11 - 12 (HIGH SCHOOL)	ADVANCED APPLICATION

APPLYING THE CODE TO AN INSTRUCTIONAL OBJECTIVE

INSTRUCTIONAL OBJECTIVE IDENTIFICATION CODE-- 9 DIGITS

```
*********************************************
* 0  5  5  4  4  0  3  0  1     *
*********************************************
  *CONCEPT IDENTIFIER* LEVEL * UNIQUE
                              NUMBER
```

EXAMPLE OBJECTIVE NUMBER 055440301

05544--AN OBJECTIVE DEALING WITH THE DISTINGUISHING OF MAIN AND SUBORDINATE IDEAS IN A READING PASSAGE
03--THIS OBJECTIVE AS WRITTEN AS APPROPRIATE FOR A GRADE 4-6 READING CURRICULUM
01--THIS OBJECTIVE AT THIS LEVEL IS THE FIRST IN THE CURRICULUM BANK.

EACH OBJECTIVE CARRIES, IN ADDITION TO ITS 9-DIGIT IDENTIFIER, UP TO 4 ADDITIONAL CODES WHICH FURTHER DELINEATE THE OBJECTIVE AS APPROPRIATE IN CERTAIN STIMULUS-RESPONSE SETTINGS.

SOME SAMPLE STIMULUS-RESPONSE CODES ARE

STIMULUS

06--MATERIALS PRESENTED USING ORAL LANGUAGE.
08--KINESTHETIC, THE TEACHER MOVES THE CHILD'S BODY AS A STIMULUS.

RESPONSE

THE IMPACT CURRICULUM CODING SCHEME CONT.

04--THE CHILD SAYS HIS REPONSE HAVING FOUND THE ANSWER IN MATERIAL PRESENTED TO HIM.
21--THE CHILD MOVES ABOUT AS IN FOLLOWING DIRECTIONS.

APPLYING THE CODE TO A MEASUREMENT ITEM OR TEACHING PRESCRIPTION

IT IS ESPECIALLY IMPORTANT TO NOTE THAT THE NINE DIGIT OBJECTIVE NUMBER, ONCE CREATED, IS REPEATED IN THE THIRTEEN (13) DIGIT NUMBER CREATED FOR ANY ITEM OR PRESCRIPTION WRITTEN FOR USE IN CONJUNCTION WITH THAT OBJECTIVE. FOR EXAMPLE, AN OBJECTIVE WITH THE CODE NUMBER

05612--01--05.

MIGHT LATER HAVE ITEMS OR PRESCRIPTIONS WRITTEN TO ACCOMPANY IT. A TEST ITEM, FOR EXAMPLE, MIGHT BE GIVEN THE CODE NUMBER

05612--01--05--0001.

THE DIGITS IN POSITION 10 - 13 (0001) IN THIS EXAMPLE SERVE TO MAKE EACH SUCH ITEM UNIQUE, WHILE THE FIRST NINE RELATE THE TEST ITEM TO ITS ACCOMPANYING OBJECTIVE.

*** CODING A MEASUREMENT ITEM ***

```
**************************************************
*   0  5  4  4  4  0  3  0  1  0  0  0  1       *
**************************************************
      CONCEPT    *LEVEL*UNIQUE* SEQUENCE NUMBER
      NUMBER             NUMBER   OF THIS ITEM

**********************************
 THIS PORTION OF THE ITEM NUMBER
 CORRESPONDS TO THE 9 DIGITS OF
 THE OBJECTIVE WITH WHICH THIS
 ITEM IS ASSOCIATED.
```

*** CODING A TEACHING PRESCRIPTION ***

```
**************************************************
*   0   5   5   4   4   0   3   0   1  0  0  0  1 *
**************************************************
        CONCEPT        * LEVEL *UNIQUE*
        NUMBER                  NUMBER
 **********************************
 THIS PORTION OF THE TEACHING STRATEGY
 NUMBER CORRESPONDS TO THE 9 DIGITS OF
 THE OBJECTIVE NUMBER WITH WHICH THIS
 TEACHING STRATEGY (PRESCRIPTION) IS
 ASSOCIATED.
```

THE IMPACT CURRICULUM CODING SCHEME CONT.

EACH TEACHING STRATEGY (PRESCRIPTION) CARRIES THE STIMULUS-RESPONSE CODES APPROPRIATE TO IT.

EACH TEACHING STRATEGY (PRESCRIPTION) MAY CARRY ADDITIONAL CODES FURTHER DELINEATING ITS POSSIBLE USE IN CERTAIN INSTRUCTIONAL SETTINGS AND WITH CERTAIN PREFERRED KINDS OF INSTRUCTIONAL MATERIALS (CALLED FORMATS).

EXAMPLES OF SETTING AND FORMAT CODES ARE

FORMAT

01--WORKSHEET OR WORKBOOK PAGE
12--TACHISTOSCOPE
20--FILM

SETTING

04--SELF-INSTRUCTION, SELF-HELP ACTIVITES, PROGRAMMED INSTRUCTION
08--PUPIL TO PUPIL TUTORING
02--SMALL GROUP INSTRUCTION IN SCHOOL

DISSEMINATION OF CURRICULUM WITH THE IMPACT MASTER CURRICULUM FILE

AS A REPLICATABLE IV-C PROJECT, IMPACT WILL EVENTUALLY BE INSTALLED IN MOST, IF NOT ALL THE BOCES REGIONAL COMPUTER CENTERS IN NEW YORK STATE. THE CURRENT CONFIGURATION OF THE REGIONAL COMPUTER CENTER NETWORK IN THE STATE IS ILLUSTRATED ON THE MAP ENTITLED 'NEW YORK STATE SCHOOL COMPUTER SERVICES SYSTEM (NYSSCSS) REGIONS' CONTAINED IN THIS PAPER. IN ALL, THERE ARE THIRTEEN SUCH SITES SOME OF WHICH HAVE SUB-UNITS CALLED 'ASSOCIATES'. THESE COMPUTER CENTERS PROVIDE VARIOUS SERVICES TO ALL THE SCHOOL DISTRICTS IN THE STATE OUTSIDE THE SO CALLED 'BIG FIVE CITIES' OF BUFFALO, ROCHESTER, SYRACUSE, YONKERS,AND NEW YORK. AT PRESENT, NEGOTIATIONS ARE UNDER WAY TO INCORPORATE AT LEAST TWO OF THSES INTO THE BOCES REGIONAL NETWORK.

THUS IT IS POSSIBLE FOR ANY OF THESE SITES TO HOUSE A MASTER CURRICULUM FILE AND MAKE THS RESOURCE AVAILABLE TO SCHOOL PERSONNELL. IT IS ALSO POSSIBLE FOR THE CURRICULUM STORED IN THE MCF OF ONE REGION TO SUPPLEMENT THAT OF ANOTHER REGION. THE PROJECT STAFF HAS PROPOSED THAT THE ORIGINAL MCF DEVELOPED AT THE CENTRAL NEW YORK REGIONAL COMPUTER CENTER SERVE AS THE BASE FOR AN MCF IN EACH OF THE OTHER REGIONS OF THE STATE WHICH ARE ILLUSTRATED ON THE MAP.

AS NEW YORK STATE MOVES INTO THE NEXT EVOLUTIONARY PHASE OF THE DELIVERY OF COMPUTER SERVICES, DISTRIBUTED DATA PROCESSING (DDP) IT MAY BECOME DESIREABLE FOR THE STORAGE AND MAINTENANCE OF THE MCF TO BECOME THE RESPONSIBILITY OF ONE OF THE LARGER CENTERS. OTHER REGIONS WOULD THEN ACCESS IT FOR PURPOSES OF STORAGE AND UPDATE AS NECESSARY DURING PROCESSING, BUT THE DATA WOULD BE HOUSED IN ONLY ONE LOCATION.

THE THEORY BEHIND THE IMPACT MCF IS TO FURTHER THE 'BANK OF INSTRUCTIONAL RESOURCES' (BOIR) NOTION ADOPTED BY DR. ROBERT O'REILLY DURING HIS TENURE AS THE PROJECT DIRECTOR OF A PROJECT KNOWN AS THE 'SYSTEM FOR PUPIL AND PROGRAM EVALUATION AND DEVELOPMENT' (SPPED) WHICH WAS UNDERTAKEN BY THE NEW YORK STATE EDUCATION DEPARTMENT IN THE LATE 1960'S AND EARLY 1970'S. O'REILLY BEGAN THE TASK OF COMPILING AND DISSEMINATING PAPER BANKS OF INSTRUCTIONAL OBJECTIVES IN READING AND MATHEMATICS. IT WAS THE INTENTION OF THE PROJECT TO EXTEND THE BANKS BY PREPARING AND COMPILING TEST QUESTIONS TO ACCOMPANY THE BANKS WHICH WOULD BE DISSEMINATED ON REQUEST TO LOCAL SCHOOL DISTRICTS FOR PURPOSES OF CREATING LOCALLY DEVELOPED CRITERION REFERENCE TESTS FOR LOCAL PROGRAM EVALUATION.

THE SED SPPED PROJECT LEFT THE TASK OF CREATING AND BANKING TEST ITEMS UNFULFILLED, AND IN LARGE MEASURE THE TASK REMAINS SO TODAY. THE DIFFICULUTY, AS ANYONE WHO HAS DONE IT KNOWS IS THE COMPLEX AND TIME CONSUMMING JOB OF WRITING, TESTING, ANALYZING, REVIEWING AND REVISING TEST ITEMS. NO SCHOOL DISTRICT OR SMALL CURRICULUM PROJECT, WORKING ON ITS OWN CAN HOPE TO ASSEMBLE A LARGE BANK OF VALID AND RELIABLE TEST QUESTIONS IN A SHORT PERIOD OF TIME.

YET, THE NEED FOR SUCH A RESOURCE STILL EXISTS. SCHOOL DISTRICTS MUST STILL PREPARE EXAMINATIONS FOR STUDENTS AND WILL CONTINUE TO DO SO RELYING PRIMARILY ON LOCAL RESOURCES FOR THE ACCMPLISHMENT OF

THE JOB. THE CONTINUED INTEREST IN TEST DEVELOPMENT CENTERS SUCH AS THE ONE IN UCLA, THE TYPES OF WORKSHOPS CONDUCTED BY DR. HAMBLETON, IN THE CONSTRUCTION OF CRITERION TESTS LEADS THE AUTHORS AND THE NUMBER OF PAPERS PRESENTED AT LAST YEAR'S AERA CONVENTION ON THE SUBJECT LEADS THE AUTHORS TO BELIEVE THAT INTEREST IN THIS AREA OF CURRICULUM DEVELOPMENT IS VERY MUCH "ALIVE AND WELL".

THE PURPOSE OF THE MCF IS TO AUTOMATE THE BOIR NOTION OF O'REILLY BY USING THE LATEST ADVANCES IN DATA PROCESSING AND WORD PROCESSING TO ACCOMPLISH THE TASK OF COLLECTING, BANKING, RETRIEVING, AND DISSEMINATING INSTRUCTIONAL OBJECTIVES, MEASUREMENT ITEMS, TEACHING PRESCRIPTIONS, AND THE VALIDATION DATA ASSOCIATED WITH EACH.

THE MCF IS A GENERIC RESOURCE SINCE THE CURRICULAR ELEMENTS MENTIONED ABOVE EXIST IN THEIR PURE FORM DISASSOCIATED FROM THE CURRICULUM OR CURRICULAR PROJECT FROM WHICH THEY ORIGINATED. A MATHEMATICS TEACHER IN BROOME COUNTY, NEW YORK, FOR EXAMPLE, MAY SIT DOWN AT A COMPUTER TERMINAL, CARD FILE, OR MICROFICHE READER TO PREPARE A TEST AND WIND UP SELECTING TEST QUESTIONS WHICH CAME FROM TEACHERS IN THE NORTH SYRACUSE AND LIVERPOOL CENTRAL SCHOOL SYSTEMS AND THE CIMS MATH PROJECT IN THE ONEIDA-HERKIMER-MADISON BOCES IN NEW HARTFORD NEW YORK.

TO ANY SINGLE USER OF THE MCF, THE ORIGIN OF THE OBJECTIVE AND ITS RELATED TEST QUESTIONS IS TRANSPARENT AND IRRELEVANT. THE LOCAL USER DETERMINES THE APPROPRIATENESS OF THE OBJECTIVE, ITEM, OR PRESCRIPTION FOR HIS/HER CURRICULUM AND IS UNCONCERNED WITH THE SOURCE.

MANY EDUCATORS HAVE RAISED THE OBJECTION THAT CURRICULUM CANNOT BE STORED ON A COMPUTER. A CURRICULUM, THEY MAINTAIN IS MORE THAN A SERIES OF CRITERION OBJECTIVES AND THEIR RELATED MEASURES. IN THE LARGER SENSE THEY ARE CORRECT. THE MCF CONTAINS THE DISTILLATION OF THE CURRICULUM, THE MEASUREABLE OUTCOMES IN THE COGNITIVE DOMAIN. THE CREATORS OF THE MCF HAVE NEVER MAINTAINED OTHERWISE.

IN ITS MCF, THE IMPACT PROJECT HAS CHOSEN TO TAKE THE NARROWER VIEWPOINT OF ROBERT MAGER, AND OTHERS, THAT THE ESSENCE OF THE CURRICULUM IS THE MEASUREABLE LEARNER OUTCOMES. WE CERTAINLY DO NOT DENY THAT A COMPLETE CURRICULUM IS "GREATER THAN THE SUM OF ITS PARTS" AND PRODUCES MANY DESIREABLE OUTCOMES. IT MUST, HOWEVER, INCREASE LEARNING. THE DEFINITION AND MEASUREMENT OF THESE LEARNING OUTCOMES IS THE FOCUS OF THE MASTER CURRICULUM FILE.

THE IMPACT PHILOSOPHY TOWARDS CURRICULUM BANKING AND DISSEMINATION CAN BE ILLUSTRATED BEST BY INVOLVEMENT OVER THE LAST TWO YEARS WITH A CURRICULUM DEVELOPMENT PROJECT KNOW AS THE "ONEIDA COUNTY CIMS MATH PROJECT" UNDER THE DIRECTION OF MS. KATHLEEN CAMERON.

THE SCHOOL DISTRICTS IN A NEIGHBORING BOCES (ONEIDA-HERKIMER-MADISON) ENTERED JOINTLY INTO A K-6 MATH CURRICULUM DEVELOPMENT PROJECT. THE DISTRICTS AGREED JOINTLY TO STIPEND TEACHERS TO SELECT AND/OR WRITE MATH OBJECTIVES, ITEMS AND TEACHING ACTIVITIES WHICH WERE TEXTBOOK INDEPENDENT. THE TEACHERS PREPARED A SCOPE AND SEQUENCE FOR THE OBJECTIVES AND DESIGNED SEVERAL DIFFERENT KINDS OF TEST FORMS FOR EACH GRADE LEVEL

DISSEMINATION OF CURRICULUM WITH THE IMPACT MASTER CURRICULUM FILE CONT.

TO EVALUATE PUPIL PERFORMANCE AND CURRICULAR APPROPRIATENESS. DURING LATTER HALF OF THEIR FIRST YEAR OF DEVELOPMENT, THEY ENTERED INTO A PARTNERSHIP WITH THE IMPACT PROJECT. WE WERE TO PROVIDE THEM WITH MCF SERVICES FOR THE VALIDATION OF THEIR TEST QUESTIONS, AND CRT DAILY PROCESSING SERVICES FOR THE TEST FORMS ADMINISTERED TO THEIR STUDENTS DURING THE SCHOOL YEAR.

AFTER THE FIRST SCHOOL YEAR, REPORTS FROM THE MCF COMPONENT WERE UTILIZED DURING THE PROCESS OF REVIEWING AND REVISING THE TEST QUESTIONS USED DURING THE FIRST YEAR. ANALYSIS OF THE CUMULATIVE STUDENT ITEM RESPONSE DATA CONTAINED IN EACH ITEM'S MCF RECORD MADE THE ITEM REVIEW PROCESS MORE PURPOSEFUL AND OBJECTIVE.

DURING THE SCHOOL YEAR 1981-82, THE ONDEIDA COUNTY PROJECT IS TO BE REPLICATED BY THE SCHOOL DISTRICTS IN BROOME COUNTY. IT IS LIKELY THAT THE BROOME COUNTY PROJECT WILL NOT BE IDENTICAL TO THE ONEIDA COUNTY PROJECT. THE BROOME TEACHERS MAY WISH TO ADOPT A DIFFERENT SCOPE AND SEQUENCE AND DEVELOP DIFFERENT TEST FORMS. THE RAW ELEMENTS OF THE ONEIDA COUNTY PROJECT, HOWEVER, THE OBJECTIVES AND TEST QUESTIONS, MAY EASILY BE TRANSPORTED TO THE BROOME COUNTY COMPUTER CENTER FOR USE BY THE PERSONNELL IN THAT REGION.

STRUCTURING CURRICULAR ELEMENTS ON THE IMPACT COMPUTER DATA BASE

THE IMPACT MASTER CURRICULUM IS A COMPUTER DATA BASE HOUSED IN A CENTRAL COMPUTER FACILITY OPERATING WITH A COMPUTER OF THE IBM 370 OR 4300 GENERATION. THE DATA BASE MANAGEMENT SYSTEM (DBMS) USED THROUGHOUT THE NYS REGIONAL COMPUTER CENTER NETWORK IS CINCOM'S 'TOTAL'.

'TOTAL' IS A ** RELATIONAL ** DBMS. SUCH A DATA BASE. THE CONCEPT UNDERLYING SUCH A DATA BASE IS THAT ONLY WHEN ONE SET OF DATA (OR FILE) IS RELATED TO ANOTHER LOGICAL GROUP OF DATA, IS A DIRECT LINKAGE CONSTRUCTED BETWEEN THEM. THUS, SEPARATE CROSS REFERENCE FILES AND LINKAGE FILES ARE NO LONGER REQUIRED. THE INCREASE OF COMPLEXITY IS DIRECTLY PROPORTIONAL TO THE NUMBER OF DIRECT RELATIONSHIPS EXISTING AMONG A NUMBER OF LOGICAL DATA SETS. WHEN LOGICAL DATA SETS ARE CONSIDERED AS NODES WITH DIRECT ACCESSING PATHS CONNECTING THEM, A RELATIONAL DATA BASE IS FORMED.

THE 'TOTAL' DATA BASE CONSISTS OF MASTER FILES AND VARIABLE FILES CONNECTED BY LINKAGES. THE MASTER FILES MAY BE READ DIRECTLY BY THE APPLICATION PROGRAMS. A VARIABLE FILE MAY ONLY BE READ THROUGH A LINKED MASTER FILE. A VARIABLE FILE IS TYPICALLY READ THROUGH A MASTER FILE. IN THE IMPACT MASTER CURRICULUM FILE. THE VARIABLE FILES ARE LINKED TO SEVERAL MASTER FILES IN ORDER TO BROADEN THE NUMBER OF SEARCH AND RETRIEVAL PATHS WHICH MAY BE FOLLOWED IN ORDER TO PROVIDE THE USER WITH THE GREATEST FLEXIBILITY DURING SEARCH AND RETRIEVAL.

USING THE OBJECTIVE BELOW AS AN EXAMPLE, THE FOLLWING IS AN ILLUSTRATION OF HOW THIS OBJECTIVE WOULD BE STORED IN THE MCF DATA BASE.

```
*************************************************************************
*                MASTER CURRICULUM FILE INQUIRY-OBJECTIVE               *
*                                                                       *
*  AREA-3000    READING AND LANGUAGE ARTS                               *
*                                                                       *
*  OBJECTIVE NUMBER 088530306       DICTIONARY GUIDE WORDS              *
*         CONCEPT - 08853                                               *
*        INST LVL - 03                                                  *
*         OBJ SEQ - 06                                                  *
*                                                      PRE      POST    *
*  STIMULUS -        03        NUMBER TESTED    - 000215  000431        *
*  RESPONSE -        05        NUMBER MASTERED - 000162  000389         *
*  STATUS           ACTIVE                                              *
*                                                                       *
*  LINE                        LINE TEXT                                *
*                                                                       *
*  01 GIVEN AN ENTRY WORD AND TWO GUIDE WORDS, THE STUDENT              *
*  02 DESIGNATES WHETHER THE ENTRY WORD WOULD FALL BEFORE,              *
*  03 BETWEEN, OR AFTER THE GUIDE WORDS.                                *
*************************************************************************
```

THE DATA WOULD BE DIVIDED BETWEEN A MASTER RECORD AND A VARIABLE RECORD. THE MAJOR DIVISION COMING BETWEEN THE OBJECTIVE IDENTIFICATION RECORD AND THE OBJECTIVE TEXT INFORMATION. THUS THE MASTER RECORD WOULD CONTAIN

```
*************************************
* 3000/088530306/DICTIONARY GUIDE   *
* WORDS/STIMULUS CODES/RESPONSE     *
* CODES/VALIDATION COUNTERS         *
*************************************
                                    *
THE MASTER RECORD IS                *   LINKAGE TO THE OBJECTIVE
LINKED TO THE VARIABLE              *   TEXT IS BY THE NUMBER
RECORD BY THE AREA/OBJEC.           *   3000/088530306
NUMBER.                             *
                                    *
THE VARIABLE CONTAINS THE           *
TEXT OF THE OBJECTIVE ITSELF.       *
                                    *
*************************************
* GIVEN AN ENTRY WORD AND TWO       *
* GUIDE WORDS, THE STUDENT DES-     *
* IGNATES WHETHER THE ENTRY WORD    *
* WOULD FALL BEFORE, BETWEEN, OR    *
* AFTER THE GUIDE WORDS             *
*************************************
```

THE DATA IS SPLIT IN THIS WAY TO SPEED RETRIEVAL AND READING OF THE DIFFERENT PARTS OF THE COMPLETE RECORD DURING VARIOUS KINDS OF PROCESSING. FOR EXAMPLE, WHEN SCORING A DAILY TEST, OR UPDATING THE VALIDATION COUNTERS, ONLY THE SHORT DESCRIPTOR -- DICTIONARY GUIDE WORDS -- IS NEEDED. THESE TWO PIECES OF INFORMATION CAN BE LOCATED AND READ QUICKLY USING ONLY THE MASTER RECORD. THE VARIABLE RECORD, CONTAINING THE FULL TEXT INFORMATION IS ONLY NEEDED DURING A RETRIEVAL OF

THE OBJECTIVE FOR CURRICULUM DEVELOPMENT PURPOSES. IDENTICAL LOGIC IS APPLIED TO THE STORAGE OF THE MEASUREMENT ITEMS AND TEACHING PRESCRIPTIONS ON THE MCF.

TO THE USER OF THE MCF FOR CURRICULUM DEVELOPMENT PURPOSES, OR TO THE APPLICATION COMPUTER PROGRAMMER, THIS STRUCTURING OF THE DATA IS TRANSPARENT. TO SUCH A PERSON, THE DATA APPEARS AS IF IT WERE HOUSED IN ONLY ONE PLACE.

THE READER IS DIRECTED TO THE FOLLOWING CHARTS INCLUDED WITH THE PAPER FOR A GRAPHIC DISPLAY OF THE STRUCTURE OF THE DATA BASE, THE WAYS THE ELEMENTS MAY BE DISSEMINATED, AND THE WAY THE FILES ARE SEARCHED IN ON-LINE RETRIEVAL WITH CRT TERMINALS.

1. IMPACT STUDENT ACHIEVEMENT DATA AND INSTRUCTIONAL MANAGEMENT SYSTEM MASTER CURRICULUM FILE ON-LINE SEARCH PROCEDURES.

2. DISSEMINATING THE ELEMENTS IN THE IMPACT MCF.

3. THE STRUCTURE OF THE IMPACT DATA BASE.

VALIDATING CURRICULUM WITH THE IMPACT MASTER CURRICULUM FILE

AS MAY BE SURMISED FROM THE INTRODUCTION, THE IMPACT MCF CONSISTS OF A BANK OF INSTRUCTIONAL RESOURCES (BOIR) ASSEMBLED OVER TIME FROM A VARIETY OF SOURCES. THUS, THE COUNTERS DESCRIBED IN THE FIRST SECTION ARE UPDATED WITH STUDENT RESPONSE DATA COLLECTED AT DIFFERENT POINTS IN TIME AND FROM A VARIETY OF STUDENTS IN DIFFERENT LOCATIONS. THE ONLY COMMON LINK BETWEEN THESE STUDENTS IS THE FACT THAT THEY HAVE BEEN ASSIGNED THE SAME LEARNING OBJECTIVE AND HAVE BEEN TESTED FOR MASTERY USING THE SAME ITEM POOL. THE ITEM POOL BEING DEFINED AS THE SET OF TEST ITEMS WHICH HAS BEEN PREPARED TO MEASURE THE LEARNING OBJECTIVE ASSIGNED. THIS POOL OF ITEMS WILL NOT HAVE BEEN USED ON A SINGLE TEST FORM, OR EVEN A COMMON SET OF TEST FORMS AND A SINGLE GROUP OF STUDENTS WILL PROBABLY NOT HAVE BEEN TESTED USING ALL THE ITEMS IN A GIVEN ITEM POOL.

PROBLEM STATEMENT

THE TERMS VALIDITY AND RELIABILITY AS THESE APPLY TO CRITERION REFERENCED EVALUATION HAVE RECEIVED A GREAT DEAL OF ATTENTION IN THE LITERATURE SINCE 1970. THE PRIMARY ISSUES IN THE APPLICATION OF THESE TERMS TO CRITERION REFERENCED EVALUATION IN GENERAL AND THE ITEM POOLS PRESENT IN THE IMPACT MASTER CURRICULUM FILE IN PARTICULAR SEEM TO BE THE FOLLOWING

1. THE TRADITIONAL CONCEPTS OF VALIDITY AND RELIABILITY AS APPLIED TO NORM REFERENCED TESTING DO NOT APPLY IN THE SAME WAY TO CRITERION REFERENCED TESTING.

2. THE STATISTICAL METHODS CONSTRUCTED FOR CRITERION REFERNCED TESTING ARE MOST FREQUENTLY APPLIED IN A WHOLISTIC FASHION TO SPECIFIC TEST FORMS AND NOT POOLS OF TEST ITEMS WHICH EXIST INDEPENDENTLY OF ANY PARTICULAR TEST FORM OR GROUP OF TEST FORMS.

3. IT MAY BE NECESSARY, THEREFORE, TO CONSIDER THE POSSIBILITY THAT NEW STATISTICAL METHODS ARE NEEDED TO APPLY THE TERMS VALIDITY AND RELIABILITY TO ITEM POOLS RATHER THAN APLYING CURRENT STATISTICAL METHODS.

A REVIEW OF THE LITERATURE

THE PURPOSES OF CRITERION-REFERENCED (CR) MEASUREMENT HAVE BEEN DISCUSSED QUITE PREVALENTLY IN THE LITERATURE BY POPHAM (1975), HAMBLETON AND NOVICK (1973), GLASER AND NITKO (1971), MILLMAN (1974), ALKIN (1974), AND SMITH (1978) AMONG OTHERS. THE MOST IMPORTANT PURPOSES OF CR MEASUREMENT IS CERTAINLY THE ASSIGNMENT OF INDIVIDUALS TO THEIR TRUE STATE AND LEVEL OF PERFORMANCE. THIS IS USUALLY EXPRESSED IN TERMS OF PASS-FAIL, MASTERY OR NONMASTERY. MOST OTHER USES OF CR EVALUATION SUCH AS ASSESSING PROGRAM EFFECTIVENESS, APPROPRIATENESS OF THE OBJECTIVE-BASED CURRICULUM ARE SIMPLY DERIVED FROM AN AGGREGATION OF THE INDIVIDUAL PUPIL CLASSIFICATION DECISIONS.

THEREFORE, IT WOULD APPEAR THAT THE CONCEPTS OF VALIDITY AND RELIABILITY FOR CR MEASUREMENT INSTRUMENT SHOULD BE DEFINED WITH

THE BASIC INTENT OF PUPIL CLASSIFICATION AS THE PREMISE. SMITH (1978) HAS DEFINED VALIDITY AND RELIABILITY FOR CR MEASURES IN A WAY THAT SEEMS ACCEPTABLE FOR DEVELOPING A SOLUTION TO THE PROBLEM CONFRONTING PROJECT IMPACT

> "A MAJOR GOAL OF GOOD CR MEASUREMENT WOULD SEEM BE AIMED AT MAXIMIZING THE PROPORTION OF CORRECT MASTERY-TYPE DECISIONS WHICH ARE MADE REGARDING A GROUP OF EXAMINEES (VALIDITY), WHILE, AT THE SAME TIME, PROVIDING A HIGH DEGREE OF CONSISTENCY (ACROSS REPEATED ADMINISTRATIONS OF THE INSTRUMENT) (RELIABILITY)." (P. 1)

HAMBLETON, ET. AL. (1978) IN THEIR REVIEW SUPORT THE CONCLUSION OF SMITH WHILE, AT THE SAME TIME, WARNING OF A NUMBER OF TECHNICAL PROBLEMS CONCERNING THE REDUCTION OF THE TWO MOST COMMON ERROR SITUATIONS WHICH ARE PREVALENT IN CR MEASUREMENT -- FALSE POSITIVE AND FALSE NEGATIVE JUDGEMENTS CONCERNING A LEARNERS TRUE MASTERY STATUS. THESE TECHNICAL ISSUES WILL BE DEALT WITH AGAIN LATER IN THIS SECTION OF THE PAPER.

USING SMITH'S (1978) DEFINITION OF RELIABILITY, THE CONSISTENCY WITH WHICH THE MEASURE CLASSIFIES EXAMINEES AS MASTERS OR NONMASTERS OF THE OBJECTIVE, THERE ARE A NUMBER OF APPROACHES IN CLASSICAL TEST THEORY THAT COULD BE TAKEN. A RATHER COMPLETE SET OF ARGUMENTS AGAINST THE USE OF RELIABILITY ESTIMATES BASED UPON CLASSICAL TEST THEORY AND SOME RECENT APPROACHES TO CALCULATING RELIABILITY COEFFICIENTS CAN BY FOUND IN THE HAMBLETON ET. AL. (1978) ARTICLE. RATHER THAN REVIEW EACH STATISTICAL TECHNIQUE, TECHNIQUES FOR ESTIMATING VALIDITY AND RELIABILITY THAT PAST STUDIES HAVE SHOWN ARE GENERALLY SUCCESSFUL WILL BE BRIEFLY MENTIONED.

CARVER (1970) HAS PROPOSED AN APPROACH TO RELIABILITY THAT IS NOT BASED UPON A CORRELATIONAL CALCULATION SINCE RELIABILITY DEPENDS UPON REPLICABILITY, BUT REPLICABILITY DOES NOT DEPEND UPON VARIANCE. RATHER, THE PROCEDURE IS TO ADMINISTER TWO ALTERNATE PARRALLED FORMS OF A TEST AND COMPARE THE PERCENTAGE OF MASTERS ON THE TWO TESTS. WHEN THERE IS A HIGH PERCENTAGE OF AGREEMENT BETWEEN THE TWO SETS OF RESULTS, THE TESTS CAN BE CONSIDERED RELIABLE.

BOTH THE PHI AND KAPPA CORRELATIONAL COEFFICIENTS HAVE BEEN WIDELY USED, BUT REID AND ROBERTS (1978) FOUND THAT BOTH CALCULATIONS PRODUCE ALMOST IDENTICAL CORRELATIONAL VALUES WHEN A MONTE CARLO COMPARISON WAS MADE.

PERHAPS THE APPROACH RECEIVING THE MOST ATTENTION AND SUPPORT IS THAT OF DETERMINING APPROPRIATE CUT OFF SCORES (SCORE VALUE AT WHICH ONE HAS CONFIDENCE THE EXAMINEE IS A TRUE MASTER OF THE INSTRUCTIONAL OBJECTIVE). MILLMAN (1973) IS PROBABLY ONE OF THE MOST PROMINENT DEVELOPER-RESEARCHERS IN THIS AREA. GENERALLY, THE PROCEDURES HE PROPOSES ARE BASICALLY PROFESSIONAL JUDGEMENT RATHER THAN STATISTICAL (E.G. DETERMINE A CUT OFF SCORE AT WHICH A PRE-DETERMINED PERCENTAGE PASS, EXPERT INSPECTION OF ITEMS AND ESTIMATION OF THE NUMBER NEEDED TO BE CONSIDERED A MASTER AND A CONSIDERATION OF THE CONSEQUENCE OF

CLASSIFICATION ERRORS OF A PRE-DETERMINED CUT OFF SCORE).

HAMBLETON, ET. AL. (1978) DISCUSSES A USEFUL METHOD OF DETERMINING CUTOFF SCORES DEVELOPED BY BERK. ESSENTIALLY THE METHOD REQUIRES THE SEPARATION OF EXAMINEES INTO INSTRUCTED AND UNINSTRUCTED GROUPS. THE DISTRIBUTION OF EACH GROUP OF EXAMINEE'S SCORES FROM 0 TO 'N' WHERE 'N' IS THE NUMBER OF ITEMS, CAN BE DIVIDED BY A CUTTING SCORE INTO ONE OF TWO MUTUALLY EXCLUSIVELY GROUPS, MASTERS AND NONMASTERS.

> 'UNDER THE ASSUMPTION THAT THE EXAMINEES IN THE INSTRUCTED GROUP ARE TRUE MASTERS, THE EXAMINEES ARE DIVIDED ON THE BASIS OF THE CUT-OFF SCORE INTO TWO CATEGORIES TRUE MASTERS (TM), AND FALSE NONMASTERS (FN). SIMILARLY THE STUDENTS IN THE UNINSTRUCTED GROUP ARE CLASSIFIED AS FALSE MASTERS (FM), AND TRUE NONMASTERS (TN). THE SCORE DISTRIBUTIONS FOR THE INSTRUCTED AND UNINSTRUCTED GROUPS ARE THE PRIMARY DETERMINANTS OF THE EXTENT TO WHICH A TEST CAN CLASSIFY EXAMINEES AS TRUE MASTERS AND TRUE NONMASTERS. THE VALUE OF 'C' IS DETERMINED FROM AN EXAMINATION OF THE CELL PROBABILITIES FOR THE CUTTING SCORE CLASSIFICATION. THE OPTIMUM CUT-OFF SCORE IS THE ONE THAT MAXIMIZES THE PROPORTION OF CORRECT CLASSIFICATIONS, OR EQUIVALENTLY, MINIMIZES THE PROPORTION OF INCORRECT CLASSIFICATIONS. THE PROPORTION OF THE CORRECT CLASSIFICATIONS FOR A FOR A PARTICULAR CUT-OFF SCORE IS EQUAL TO THE PROPORTION OF EXAMINEES IN THE INSTRUCTED GROUP ASSIGNED TO A MASTERY STATE PLUS THE PROPORTION OF EXAMINEES IN THE UNINSTRUCTED GROUP ASSIGNED TO A NONMASTERY STATE. THE USEFULNESS OF THE INFORMATION PROVIDED BY BERK'S APPROACH DEPENDS ON VALIDITY OF THE ASSUMPTION EQUATING THE INSTRUCTED GROUP WITH TRUE MASTERS, AND THE UNINSTRUCTED GROUP WITH TRUE NONMASTERS.' (P. 31)

IN A PAPER RECENTLY PRESENTED AT AERA, SMITH (1978) COMPARED FIVE PROMINENT METHODS OF ITEM SELECTION FOR DEVELOPING CRITERION REFERENCED TESTS USING A KRUSKAL-WALLIS ANALYSIS OF VARIANCE. THE FIVE METHODS INVESTIGATED WERE

1. POINT BISERIAL CORRELATION
2. DIFFERENCE BETWEEN PRE AND POSTTEST PROPORTION OF EXAMINEES ANSWERING THE ITEM CORRECTLY (COX AND VARGAS, 1966)
3. DIFFERENCE BETWEEN THE PROPORTION OF EXAMINEES IN THE MASTERY AND NONMASTERY GROUP PASSING THE ITEM
4. THE PHI CORRELATIONAL COEFFICIENT
5. RANDOM SELECTION OF ITEMS.

HIS GENERAL CONCLUSION WAS THAT NO PARTICULAR METHOD OF ITEM SELECTION YIELDED TEST INSTRUMENTS OF CONSISTENT SUPERIORITY. HOWEVER HE DID NOTE THAT WHEN DIFFERENT INSTRUCTIONAL SITUATIONS WERE KNOWN OR ANTICIPATED, THERE WERE DEFINITE ADVANTAGES OF ONE METHOD OVER

ANOTHER.

> 'WHEN A 'FAIR AMOUNT' OF VARIABILITY IS PRESENT IN THE DISTRIBUTION OF SCORES, ... THE RPB METHOD WAS SUPERIOR TO THE OTHER METHODS. HOWEVER, IN TRUE MASTERY-LEARNING SITUATIONS, ... THE COX AND VARGAS METHOD OF ITEM SELECTION IS TO BE RECOMMENDED. FINALLY, IN THOSE SITUATIONS WHERE INSTRUCTION IS RELATIVELY INEFFECTIVE, ... THE BR (RANDOM SELECTION) AND PHI METHODS TENDED TO YIELD THE BEST INSTRUMENTS.' (P. 11)

ALL METHODS TO DETERMINE THE CONTENT VALIDITY OF A GIVEN TEST QUESTION SEEM TO POINT TO PROFESSIONAL JUDGEMENT AS THE METHOD OF CHOICE. CONTENT VALIDITY IS HERE DEFINED AS THE DETERMINATION THAT A GIVEN TEST ITEM, GROUP OF ITEMS, OR TEST FORM WILL ELICIT THE KINDS OF BEHAVIORS STATED IN THE OBJECTIVE ON WHICH THOSE ITEM(S) OR TEST FORM WAS/WERE BASED. IN ANY EVENT, CONTENT VALIDITY, IS MORE A MATTER FOR CONCERN AT THE TIME THE TEST ITEMS ARE CREATED, THOUGH AFTER THE FACT EMPIRICAL DATA MAY FORM THE BASIS FOR INTELLIGENT ITEM REVIEW AND REVISION.

CONSTRUCT VALIDITY, ON THE OTHER HAND, RELATES TO THE INTERPRETATION OF CR TEST RESULTS IN THE LIGHT OF MORE GLOBAL CONSTRUCTS RELATED TO THE UNIVERSE OF SKILLS FROM WHICH THE OBJECTIVE OR SET OF OBJECTIVES WAS DRAWN.

FROM THE LITERATURE AVAILABLE ON CRITERION-REFERENCED MEASUREMENT THE SAMPLE SELECTED FOR THIS REVIEW HIGHLIGHTS THE POINT THAT THERE IS NO CONSENSUS IN THE PSYCHOMETRIC FIELD ON THE MOST APPROPRIATE WAYS TO DEVELOP AND DETERMINE VALID AND RELIABLE MEASURES. HOWEVER, MUCH RESEARCH AND DEVELOPMENT WORK HAS BEEN UNDERTAKEN AND SOME PROMISING APPROACHES TO THE PROBLEMS HAVE BEEN IDENTIFIED.

A PROPOSED METHOD OF VALIDATING THE TEST ITEM POOLS IN THE MCF

THE BASIC PROBLEM BEING ADDRESSED HERE IS THE DETERMINATIONN OF A SET OF PROCEDURES TO BE INCORPORATED INTO THE PROJECT IMPACT EVALUATION SYSTEM THAT WILL ENSURE THAT THE CRITERION REFERENCED ITEM POOLS PROVIDE ACCURATE AND CONSISTENT MEASURES OF THE CURRICULAR OBJECTIVES FOR WHICH THEY WERE DESIGNED.

THE REVIEW OF THE LITERATURE POINTS OUT THAT THIS PROBLEM HAS NOT BEEN ADDRESSED TO THE DEGREE THAT THE DETERMINATION OF THE VALIDITY AND RELIABILITY OF A SPECIFIC CR TEST FORM HAS BEEN. THE DETERMINATION OF AN INDIVIDUAL TEST'S ACCURACY AND CONSISTENCY CAN BE CONSIDERED A VERY DIFFERENT MATTER FROM THE DETERMINATION OF THE SAME QUALITIES FOR AN ITEM POOL FROM WHICH A LARGE NUMBER OF DIFFERENT TEST FORMS CAN BE GENERATED.

THE APPROACH SUGGESTED BY THE AUTHORS IS THAT EACH ITEM POOL FOR AN OBJECTIVE BE TREATED AS IF IT WERE A TEST FORM FOR THAT OBJECTIVE. IF ONE ACCEPTS THAT PREMISE, THEN EACH ITEM POOL CAN BE SUBJECTED TO THE SAME TYPE OF ANALYTICAL TREATMENT THAT THE LITERATURE INDICATES IS APPROPRIATE.

****
* MEASUREMENT ACCURACY *
* ---------- *
* VALIDITY *
****

THE PROCEDURE RECOMMENDED FOR DETERMINING THE CLASSIFICATION ACCURACY OF THE CRITERION REFERENCED ITEMS IS A TWO PHASED, ITERATIVE ONE. PHASE ONE WOULD BE THE DETERMINATION OF THE CONTENT VALIDITY OF THE ITEMS IN THE POOL. THIS IS BASICALLY A PROFESSIONAL, JUDGEMENTAL PROCESS. A TEAM OF EDUCATORS CONSIDERED TO HAVE EXPERTISE IN A PARTICULAR SUBJECT MATTER FIELD, FOR EXAMPLE MATHEMATICS, WOULD REVIEW ALL ITEMS DEVELOPED AND/OR COLLECTED RELATIVE TO THEIR ASSOCIATED OBJECTIVE. USING A RATING PROCEDURE SIMILAR TO THAT PROPOSED BY ROVINELLI AND HAMBLETON (1977), EACH MEASUREMENT ITEM WILL BE JUDGED AS TO ITS VALIDITY AS AN ACCURATE MEASURE OF THE OBJECTIVE. MEAN JUDGEMENTAL RATINGS WILL BE CALCULATED FROM THE INDIVIDUAL RATINGS AND ASSIGNED TO EACH ITEM. ITEMS FALLING BELOW A MINIMALLY ACCEPTABLE VALUE WILL BE EITHER REWRITTEN OF DISCARDED FROM THE POOL.

PHASE TWO WILL BE AN EMPERICAL APPROACH TO DETERMINING THE CLASSIFICATION ACCURACY (CONSTRUCT VALIDITY) USING STUDENT RESPONSE DATA TO THE ITEMS IN THE POOL. SINCE THE ITEMS FROM THE POOL WILL BE SELECTED AND USED ON A NUMBER OF DIFFERENT TEST FORMS VARYING FROM SCHOOL DISTRICT TO SCHOOL DISTRICT AND ADMINISTERED TO DIFFERENT STUDENT POPULATIONS AT DIFFERING TIMES THROUGHOUT THE YEAR, THIS PHASE WILL BE CONDUCTED AT THE END OF EACH SCHOOL YEAR.

BASED UPON THE FINDINGS OF SMITH (1978) AND THE ARGUMENTS OF MILLMAN (1974), THE PROCEDURES DEVELOPED BY COX AND VARGAS (1966) ARE PROPOSED AS THE MOST PRACTICAL AND USEFUL WAY OF DETERMINING CONSTRUCT VALIDITY FOR A CRITERION REFERENCED ITEM POOL. THIS PROCEDURE WILL ENTAIL MAINTAINING PRE-INSTRUCTION ITEM RESPONSE DATA BY MASTERS AND NONMASTERS OF THE OBJECTIVE AND POST INSTRUCTION ITEM RESPONSE DATA BY THE SAME TWO CLASSIFICATIONS. THE PROPORTION OF DIFFERENCE BETWEEN PRE AND POST CORRECT RESPONSES WILL BE CALCULATED FOR THE DIFFERENT CLASSIFICATION GROUPS. ITEMS WITH SIMILAR HIGH PROPORTION GAINS FOR POST INSTRUCTION MASTERS WILL BE CONSIDERED TO HAVE CONSTRUCT VALIDITY.

****
* MEASUREMENT CONSISTENCY *
* ---------- *
* RELIABILITY *
****

THE PROCEDURES USED AND ADVOCATED FOR DETERMINING MEASUREMENT CONSISTENCY ALMOST ALWAYS INVOLVE CALCULATION OF A STATISTIC ON A PARTICULAR TEST FORM, NOT AN ASSEMBLED POOL OF ITEMS. ALSO, MOST OF THEM ARE CORRELATIONAL TECHNIQUES DEVELOPED FOR NORM REFERENCED MEASUREMENT PURPOSES WITH ALL THEIR INHERENT WEAKNESSES WHEN APPLIED TO CRITERION-REFERENCED MEASURES.

BOTH THE PHI AND KAPPA METHODS HAVE BEEN WIDELY EMPLOYED AS MEASURES OF CR RELIABILITY WITH NEITHER SEEMING TO BE MORE ADVANTAGEOUS. REID AND ROBERTS (1978), WHILE REACHING THE ABOVE CONCLUSION, RECOMMENDED THE USE OF PHI AS IT IS MORE WIDELY KNOWN AND IS A CORRELATIONAL MEASURE.

HOWEVER, SMITH'S (1978) STUDY FOUND THAT IN A TRUE MASTERY LEARNING SITUATION, THE COX AND VARGAS TECHNIQUE IS PREFERRED FOR THE DETERMINATION OF CONSTRUCT VALIDITY. IT IS RECOMMENDED THAT IT ALSO BE USED AS THE APPROACH FOR ENSURING CONSISTENCY IN THE DETERMINATION OF CLASSIFICATION DESIGNATIONS (RELIABILITY).

SUMMARY

THE MASTER CURRICULUM FILE (MCF) IS A COMPUTERIZED DATA BASE OF THREE TYPES OF CURRICULAR BUILDING ELEMENTS. THESE ELEMENTS ARE INSTRUCTIONAL OBJECTIVES, MEASUREMENT ITEMS AND TEACHING PRESCRIPTIONS. THE DATA BASE STORES THE FULL TEXT OF EACH ELEMENT, A NUMBER OF CODED DESCRIPTORS, AND STUDENT RESPONSE DATA GATHERED FOR EACH ELEMENT DURING CRITERION REFERENCED TESTING.

SEARCH AND RETRIEVAL OF THESE ELEMENTS IS POSSIBLE USING A NUMBER OF COMPUTER PROGRAMS. FILES MAY BE SEARCHED IN EITHER A BATCH OR ON-LINE MODE. THE BASIS OF THE MCF CODING SCHEME IS A FOUR DIGIT AREA NUMBER AND NINE DIGIT OBJECTIVE NUMBER. THE FOUR DIGIT AREA NUMBER IDENTIFIES DESCRIBES THE MAJOR CURRICULAR DISCIPLINE, E.G. READING, MATH, SCIENCE, ETC., TO WHICH THE OBJECTIVE BELONGS.

THE AREA NUMBERS WERE DERIVED FROM THE BASIC EDUCATIONAL DATA SYSTEM'S (BEDS) COURSE IDENTIFIER CODES. THE LIST IS COMPREHENSIVE AND IS UNIVERSALLY APPLIED THROUGHOUT NEW YORK STATE.

THE NINE DIGIT OBJECTIVE NUMBER IS COMPRISED OF A FIVE DIGIT CONCEPT NUMBER, TWO DIGIT INSTRUCTIONAL LEVEL INDICATOR, AND A TWO DIGIT UNIQUE SEQUENCE NUMBER. THE CONCEPT NUMBER IDENTIFIES THE CONTENT GROUP WITHIN A MAJOR CURRICULAR AREA TO WHICH THE OBJECTIVE BELONGS. THE INSTRUCTIONAL LEVEL INDICATOR CAN BE INTERPRETED IN TERMS OF MENTAL AGE, GRADE LEVEL, OR DEVELOPMENTAL STAGE. THE CONCEPT IDENTIFIER SYSTEM USED BY IMPACT WAS DESIGNED BY MS. RUTH HOWLAND OF THE PROJECT STAFF. THE DEVELOPMENT OF CONCEPT IDENTIFIERS FOR OTHER SUBJECT AREAS HAS NOT BEEN COMPREHENSIVELY UNDERTAKEN IN NEW YORK STATE, THOUGH MATHEMATICS HAS BEEN STARTED. THE AREAS OF SOCIAL STUDIES AND SCIENCE WILL BE THE NEXT AREAS ADDED TO THE FILES.

THE FIRST ISSUE ADDRESSED IN THIS PAPER WAS THE STORAGE,RETRIEVAL, AND DISSEMINATION OF CURRICULUM QUICKLY AND EFFICIENTLY FROM REGION TO REGION AND USER TO USER. THE IMPACT BANKS CURRICULUM ON A COMPUTER IN THE FORM OF A COMPUTER DATA BASE. USING THE SEARCH AND RETRIEVAL CAPABILITY OF THE COMPUTER, THE PROJECT STAFF EXTRACTS THE CURRICULAR ELEMENTS AND TRANSPORTS THEM ON MICROFICHE, INDEX CARD FILES, AND ALLOWS USERS WITH COMPATIBLE TERMINAL EQUIPMENT TO TAP THE COMPUTER FILES DIRECTLY ON DIAL-UP OR DEDICATED TELEPHONE LINES.

THE SECOND ISSUE WAS THE COLLECTION AND ANALYSIS OF VALIDATION DATA ABOUT THE CURRICULUM USING THE STUDENT RESPONSE DATA CONTAINED IN THE RECORD OF EACH CURRICULAR ELEMENT STORED ON THE COMPUTER. THE IMPACT SYSTEM COLLECTS THE STUDENT RESPONSE DATA THROUGH THE PROCESSING OF CR TESTS AND OTHER RELATED DATA AND STORING THE APPROPRIATE DATA IN THE MASTER CURRICULUM FILE.

THE AUTHORS SUGGEST THAT THE POOL OF ITEMS ASSIGNED TO AN OBJECTIVE BE ANALYZED AS IF THEY WERE A TEST FORM ON THAT OBJECTIVE AS THIS SEEMS MOST IN KEEPING WITH THE CURRENT THINKING IN THIS AREA OF EDUCATIONAL RESEARCH. THE AUTHORS FURTHER RECOMMEND THAT THE PROCEDURES DEVELOPED BY COX AND VARGAS BE USED TO DETERMINE THE CONSTUCT VALIDITY OF THE ITEM POOLS AND THE RELIABILITY OF THE ITEMS.

SUMMARY CONT.

PERIODIC ANALYSIS OF THE ITEMS' CONTENT VALIDITY SHOULD ALSO BE UNDERTAKEN BY A PANEL OF CURRICULUM SPECIALISTS USING THE ITEM REVIEW PROCEDURES PROPOSED BY HAMBLETON AND OTHERS.

COPIES OF THIS AND THE OTHER PAPERS IN THE SYMPOSIUM MAY BE OBTAINED BY WRITING TO

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TEACHER REACTION TO THE USE OF A DIAGNOSTIC - PRESCRIPTIVE APPROACH TO CLASSROOM INSTRUCTION EMPLOYING A DATA AUTOMATED STUDENT ACHIEVEMENT SUPPORT SYSTEM

by

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Rationale for Computer Based Information Systems

Project IMPACT is a multi-faceted computer based information system designed to provide educators with the kinds of data and the scope of information which will enable them to make the best possible decisions relative to instruction. Teachers must make decisions every day, but their ability to make good instructional decisions is limited by the information that is available to them when they have to decide what skills to teach, how to group their students for instruction and what instructional strategies to use. Information must be accurate, timely and organized in a format that is meaningful and clear. The computer has made it possible to organize large quantities of data and process information in a timely fashion for optimum use by educators.

Studies have shown that teachers are ambivalent toward the use of computers in education. Initially, there is a fear of the unknown and a concern on their part that they do not have the background necessary for using a computerized system. When a computer managed instructional system has been implemented, teachers become concerned about accountability and the fact that computer printouts are available for administrators, boards of education, and parents to view (Schulz, 57). On the other hand, the teachers who use the information for making instructional decisions have found a useful tool for individualizing instruction, grouping students in the classroom, planning diagnostic-prescriptive activities, monitoring student progress, record keeping, and discussing student progress with parents (Keefe, 2-6).

The Master Curriculum File and Criterion Referenced Testing

This paper will focus upon the teacher's involvement in two of the four components of Project Impact, the Master Curriculum File and the Criterion Referenced Test Component. Teachers' reactions to the project as an aid for instructional decision making will be highlighted.

The Master Curriculum File contains thousands of instructional objectives, test items, and prescriptive activities. Classroom teachers became involved in the project during the summers of 1976 and 1977 when they were asked to write the prescriptive activities in reading which have become the major portion of the prescription bank. In the summer of 1978, objectives and items obtained from the New York State Education Department, as well as other test items contributed by local school districts, were added to the bank by a cadre of teachers. Teachers have continued to add elements to the Master Curriculum File as they develop their courses and criterion referenced tests.

The Criterion Referenced Test Component draws upon the elements of the Master Curriculum File. The objectives in the Master Curriculum File are cross coded to the test items and prescriptive activities so that a teacher can select course objectives and utilize the test items to devise criterion reference tests for classroom use. In this way, teachers can create their own unique courses for their classrooms or their districts and share in the decision making aspect of curriculum development.

At the same time the teachers are developing their courses, they code the test forms that are to be used during the school year. The only other clerical tasks they need to perform are coding their class lists for the computer, revising their class lists when necessary and ordering answer sheets for testing when they are needed.

The student uses answer sheets which have been pre-printed with descriptive data: the student's name, school district, teacher section and the number of the test form he is taking. After test administration, the answer sheets are returned to the Regional Computer Center where they are scored and computer printouts are generated.

Teachers' Opinionnaire

In order to ascertain whether the IMPACT system is providing the kinds of information that is useful to the classroom teacher for instructional decision making, a survey was mailed to the teachers who are using the systems (see Appendix A). In addition, four administrators were interviewed for their reactions to IMPACT.

Forty-nine opionionnaires, sixty-five percent of those mailed to teacher participants, were returned. The respondents were from two public and one non-public district in Central New York. Twenty-two of the respondents had received training in a summer workshop, twenty-seven had not.

Table I lists the questions which were asked relative to the quality of the reports in providing information for instructional decision making. The response options were: excellent, good, fair, or poor. The first two questions asked for a global reaction to the output reports in terms of decision making related to individual student performance and program content. The respondents rated the output reports as "good" or "excellent" for decision making: 80.9% of the time for student performance and 80.4% of the time for program content. A cross tabulation with attendance at a summer workshop showed 88% who attended and only 71.7% of those who did not attend gave "excellent" or "good" ratings

for information about students' performance. The figures for program content were 96% for those who attended and 61.9% for those who did not attend. In addition, teachers who rated their understanding of the project as "high" tended to rate the quality of the output reports higher. The remaining questions summarized on Table I were designed to ascertain the teachers perceptions of utility for decision making for each of the separate analysis reports produced by the system.

The Individual Student Report lists skills by objective titles and numbers, indicates mastery and mastery criteria and provides prescription titles if mastery is not attained. The report for each student is received by the teachers after each test occasion has been processed. Respondents rated this report "excellent" or "good" 84.8 percent of the time. The practice of sharing this Student Report with students received mixed reaction:

Used With Students	N = 46	Percent
to a very large extent	13	28.3
somewhat	17	37.0
very rarely	5	10.9
never	11	23.9

Free response comments included:

1. "Students keep their own files for each test occasion."
2. "Too young, teacher used it."
3. "So often students are given standardized tests and then never hear about them again. These reports made the test "real" for them and easier for them to see the value in testing."
4. "The students are very excited about receiving their own reports."
5. "They enjoyed seeing where their strengths and weaknesses were."

The enthusiasm with which some teachers reacted to the practice of sharing this report with students, while others never shared it with students, reflects a personal choice on the part of teachers in the decision making process.

The Class Diagnostic Report is also generated after each test occasion. It lists the objective titles and numbers, the names of the students who failed to master each objective, the percent mastered, and prescription titles. The listing of students by the objectives which they have not mastered provides a structure for grouping students in the classroom based upon their identified needs. It also has the capability for indicating the teaching skills which the teacher needs to strengthen. Respondents rated the information for decision making on this report "excellent" or "good" 89.1 percent of the time.

The Group Summary Report summarizes data and is most beneficial for making decisions at mid-year or at the end of the year regarding overall student performance and program assessment. Only 32 of the 49 respondents had ordered the Group Summary Report at the time the survey was taken. Of those using the report 84.4 percent found the information "excellent" or "good" for decision making.

The Test Item Matrix Report provides descriptive information about one specific test form. It analyzes each student's response, item by item, indicating whether it was correct, or if not correct, which option the student selected. By analyzing the patterns of incorrect answers the teacher might make a number of instructional decisions. The teacher may decide that the test item is confusing and revise it. The pattern of incorrect responses might be used diagnostically to determine the kinds of errors the students are making. The diagnostic information gleaned from the error patterns might lead a teacher to decide upon alternative teaching strategies. Twenty-seven teachers used the

Test Item Matrix Report with 81.5 percent reporting "excellent" or "good" information for decision making.

The Objective Matrix Report lists the students and identifies mastery or non-mastery of all objectives tested at one test occasion. Teachers can determine from this one report which students are ready for new skills and which students need reteaching. Of the 22 teachers who used this report, 87.3% gave it an "excellent" or "good" rating.

The Student Record Display is a cummulative record of objectives which were instructed over a period of time along with their mastery status. At the time of the survey, the 14 teachers who had used it gave it an "excellent" or "good" rating.

For reports to be useful, they must be current. Respondents indicated that reports were "on time" 33.3% of the time and "generally on time" 60.4% of the time. Thus, 93.7% of the respondents believed the timeliness of the reports was satisfactory for their decision making.

Additional Data Summary

The four administrators interviewed by the IMPACT Staff were very positive in their assessment of the IMPACT System, particularly the use of the Criterion Referenced Test Component which gives the teacher information for instructional decision making in the context of a mastery learning model. They felt that when there were "problems, the problems were with people, not the computer system."

The administrators' observations were given substance by cross tabulating the teachers' opinions about the efficacy of the reports with their understanding of Project IMPACT and their attendance at summer workshops.

Teachers who attended a summer workshop always rated their understanding of Project IMPACT "high" or "average", while 36.4% who did not attend rated their understanding "low" (see Table II). Teachers who attended the summer workshop rated the quality of the output "excellent" or "good" for making decisions regarding both student performance (88%) and program content (96%) while those not in attendance gave these ratings: (72.7%) for student performance and (61.9%) for program content (see Tables III and IV). The high rating for program content by those who attended a workshop reflects the fact that they participated in the decisions regarding the selection of curricular elements that became the basis for their courses.

Teachers who indicated they had a "low" understanding of Project IMPACT gave mixed ratings, following a normal distribution across the rating criteria. Teachers who indicated they had a "high" or "average" level of understanding were more supportive of the output reports for decision making (see Tables V and VI).

Conclusions

Teachers gave highly positive ratings to the efficacy of the output reports for instructional decision making. However, the opinionnaire indicated that teachers who had a "low" level of understanding of the Project and who had not attended a summer workshop placed less value on the information that they received. Yet, a majority of "low understanding" teachers believed the system was useful for supporting instructional decision making.

If teachers are to make "good" instructional decisions, a computer managed system such as Project IMPACT can provide them with the information to make those decisons. However, in order for teachers to make optimum use of infor-

mation, they must be given more than perfunctory on the job training. Administrators who intend to implement a computer managed system should place a high priority on training teachers in the use of information for instructional decision making, particularly utilizing the capability of the computer for decision making purposes.

TABLE I

TEACHER'S ASSESSMENT OF IMPACT INFORMATION FOR DECISION MAKING

		RESPONSES			
QUESTIONS	n	excellent	good	fair	poor
The Impact output reports provided _____ information to make decisions regarding student performance.	47	46.8%	34.0%	14.9%	4.3%
The IMPACT output reports provided _____ information to make decisions regarding program content.	46	37.0%	43.6%	17.4%	2.2%
The Individual Student Report provided _____ information for making decisions regarding student performance.	46	37.0%	47.8%	13.0%	2.2%
The Class Diagnostic Report provided _____ information for making decisions regarding student performance.	46	39.1%	50.0%	8.7%	2.2%
The Group Summary Report provided _____ information for making decisions regarding student performance.	32	31.3%	53.1%	12.5%	3.1%
Test Item Matrix Report provided _____ information for making decisions regarding program content.	27	40.7%	40.7%	14.8%	3.7%
Ojective Matrix Report provided _____ information for making decisions regarding program content.	22	36.4%	40.9%	22.7%	0%
The Student Record Display provided _____ information for making decisions regarding student performance	13	23.1%	61.5%	15.4%	0%

TABLE II

CROSS TABULATION: LEVEL OF UNDERSTANDING OF PROJECT IMPACT WITH WORKSHOP ATTENDANCE

	LEVEL OF UNDERSTANDING OF PROJECT IMPACT			
COUNT ROW PCT COL PCT TOT PCT	HIGH 1	AVERAGE 2	LOW 3	ROW TOTAL
1 ATTENDED A WORKSHOP	12 48.0 92.3 25.5	13 52.0 50.0 27.7	0 0.0 0.0 0.0	25 53.2
2 NOT ATTENDED A WORKSHOP	1 4.5 7.7 2.1	13 59.1 50.0 27.7	8 36.4 100.0 17.0	22 46.8
COLUMN TOTAL	13 27.7	26 55.3	8 17.0	47 100.0

NUMBER OF MISSING OBSERVATIONS = 2

TABLE III

CROSS TABULATION: QUALITY OF OUTPUT REPORTS FOR MAKING DECISIONS REGARDING STUDENT PERFORMANCE WITH WORKSHOP ATTENDANCE

QUALITY OF OUTPUT REPORTS FOR MAKING DECISION REGARDING STUDENT PERFORMANCE

COUNT / ROW PCT / COL PCT / TOT PCT	EXCELLENT 1	GOOD 2	FAIR 3	POOR 4	ROW TOTAL
1 ATTENDED A WORKSHOP	15 60.0 68.2 31.9	7 28.0 43.8 14.9	2 8.0 28.6 4.3	1 4.0 50.0 2.1	25 53.2
2 NOT ATTENDED A WORKSHOP	7 31.8 31.8 14.9	9 40.9 56.3 19.1	5 22.7 71.4 10.6	1 4.5 50.0 2.1	22 46.8
COLUMN TOTAL	22 46.8	16 34.0	7 14.9	2 4.3	47 100.0

NUMBER OF MISSING OBSERVATIONS = 2

TABLE IV

CROSS TABULATION: QUALITY OF OUTPUT REPORTS FOR MAKING DECISONS REGARDING PROGRAM CONTENT WITH WORKSHOP ATTENDANCE

QUALITY OF OUTPUT REPORTS FOR MAKING DECISIONS REGARDING PROGRAM CONTENT

COUNT / ROW PCT / COL PCT / TOT PCT	EXCELLENT 1	GOOD 2	FAIR 3	POOR 4	ROW TOTAL
1 ATTENDED A WORKSHOP	13	11	1	0	25
	52.0	44.0	4.0	0.0	54.3
	76.5	55.0	12.5	0.0	
	28.3	23.9	2.2	0.0	
2 NOT ATTENDED A WORKSHOP	4	9	7	1	21
	19.0	42.9	33.3	4.8	45.7
	23.5	45.0	87.5	100.0	
	8.7	19.6	15.2	2.2	
COLUMN TOTAL	17	20	8	1	46
	37.0	43.5	17.4	2.2	100.0

NUMBER OF MISSING OBSERVATIONS = 3

TABLE V

CROSS TABULATION: LEVEL OF UNDERSTANDING OF PROJECT IMPACT WITH QUALITY OF OUTPUT REPORTS FOR MAKING DECISIONS REGARDING STUDENT PERFORMANCE

QUALITY OF REPORTS	COUNT / ROW PCT / COL PCT / TOT PCT	LEVEL OF UNDERSTANDING OF PROJECT IMPACT: HIGH 1	AVERAGE 2	LOW 3	ROW TOTAL
EXCELLENT	1	10	11	1	22
		45.5	50.0	4.5	46.8
		76.9	42.3	12.5	
		21.3	23.4	2.1	
GOOD	2	2	11	3	16
		12.5	68.8	18.8	34.0
		15.4	42.3	37.5	
		4.3	23.4	6.4	
FAIR	3	0	4	3	7
		0.0	57.1	42.9	14.9
		0.0	15.4	37.5	
		0.0	8.5	6.4	
POOR	4	1	0	1	2
		50.0	0.0	50.0	4.3
		7.7	0.0	12.5	
		2.1	0.0	2.1	
COLUMN TOTAL		13	26	8	47
		27.7	55.3	17.0	100.0

NUMBER OF MISSING OBSERVATIONS = 2

TABLE VI

CROSS TABULATION: LEVEL OF UNDERSTANDING OF PROJECT IMPACT WITH QUALITY OF OUTPUT REPORTS FOR MAKING DECISIONS REGARDING PROGRAM

		LEVEL OF UNDERSTANDING OF PROJECT IMPACT			
	COUNT / ROW PCT / COL PCT / TOT PCT	HIGH 1	AVERAGE 2	LOW 3	ROW TOTAL
QUALITY OF REPORTS	1 EXCELLENT	8 47.1 66.7 17.4	9 52.9 34.6 19.6	0 0.0 0.0 0.0	17 37.0
	2 GOOD	3 15.0 25.0 6.5	14 70.0 53.8 30.4	3 15.0 37.5 6.4	20 43.5
	3 FAIR	1 12.5 8.3 2.2	3 37.5 11.5 6.5	4 50.0 50.0 8.7	8 17.4
	4 POOR	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 100.0 12.5 2.2	1 2.2
	COLUMN TOTAL	12 26.1	26 56.5	8 17.4	46 100.0

NUMBER OF MISSING OBSERVATIONS = 3

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APPENDIX A

IMPACT PARTICIPANT - OPTIONNAIRE

You have been using the IMPACT student and program evaluation system in your instructional program for the last year or two and have probably formulated some opinions about its value (or potential value) to you in your teaching. Also, you may have some suggestions on how the system can be used more effectively or improved for use by teachers. The intent of this questionnaire is to assist the Project IMPACT staff at the BOCES in revising the system and service to better serve the needs of teachers and students.

Please answer the following questions by checking the response that most nearly conveys your personal assessment or opinion. Space has also been provided after each question for any additional comments you desire to make. These comments could be of invaluable assistance to the project staff in making the IMPACT system the most useful support for instructional programs.

1. ____a. I attended a training workshop last summer.

   ____b. I attended a training workshop during a previous summer.

   ____c. I did not attend a training workshop last summer. (If you did not, then answer only Part B of the optionnaire beginning with question number 8).

   ____d. I received training at my school during the school year (GO TO B.)

Comment

PART A SUMMER TRAINING

2. The training provided during the summer was _____.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

3. Curriculum elements from the Master Curriculum File were _____.

_____a. readily available and easy to get

_____b. available but hard to get

_____c. were not readily available

Comment

4. The quality of the objectives, items and prescriptions available for reference and use during the workshop were _____.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

5. The computer coding forms used were _____.

_____a. easy to understand and complete

_____b. satisfactory

_____c. complicated and difficult to complete

Comment

6. Instruction for completing the computer coding forms was _____.

_____a. thorough and complete

_____b. satisfactory

_____c. unclear and hard to understand

Comment

7. The length of the summer workshop was _____.

_____a. ample to complete all work

_____b. satisfactory

_____c. somewhat short to complete everything

_____d. too short to complete what was required

Comment

PART B: USING THE IMPACT SYSTEM

8. The answer sheets for recording student responses to that question used in the IMPACT system were _____.

_____ a. the best possible for student use

_____ b. satisfactory

_____ c. presented some problems for students

_____ d. required too much time and work to use

Comment

9. The consultive assistance provided to me by the IMPACT staff throughout the year was _____.

_____ a. excellent

_____ b. good

_____ c. fair

_____ d. poor

_____ e. no opinion/did not use

Comment

10. The IMPACT staff at the Regional Computer Center was _____.

_____a. always willing to meet or talk with me

_____b. rarely available when I needed them

_____c. tried too much to impose their views on me

_____d. very helpful in solving problems

_____e. unsure of how they could help me

_____f. no opinion/no contact with project staff

Comment

11. The contact person, within my district, provided _____assistance.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

_____e. no opinion/did not use

Comment

12. The output reports from the Computer Center were _____.

_____a. always on time

_____b. generally on time as specified

_____c. usually late

_____d. did not receive any reports

Comment

13. The objectives selected and/or developed for my course were _____.

_____a. very appropriate for the students I teach

_____b. satisfactory for the students I teach but could be improved

_____c. very inappropriate for the students I teach

_____d. inappropriate because they were not developed by me

Comment

14. The test questions selected and/or developed for my course were in most cases _____measurements for the designated objectives.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

_____e. no opinion/did not use

Comment

15. The test questions were _____for the students I teach.

_____a. well designed in terms of content and difficulty

_____b. satisfactorily designed in terms of content and difficulty

_____c. a little too difficult

_____d. much too difficult and inappropriate

Comment

16. The IMPACT output reports provided _____information to make decisions regarding student performance.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

17. The IMPACT output reports provided _____information to make decisions regarding program content.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

18. Students in my classes utilized the IMPACT CRT Student Report following each test occasion to help them understand what objectives they had mastered and what objective required more attention.

_____a. to a very large extent

_____b. somewhat

_____c. very rarely

_____d. never - useless for that purpose

Comment

19. The Individual Student Report provided _____ information for making decisions regarding student performance.

_____ a. excellent

_____ b. good

_____ c. fair

_____ d. poor

Comment

20. The Class Diagnostic Report provided _____ information for making decisions regarding student performance.

_____ a. excellent

_____ b. good

_____ c. fair

_____ d. poor

Comment

21. Have you ordered and used the Group Summary Report?

_____Yes

_____No

If yes, please respond: The report provided _____information for making decisions regarding student performance.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

22. Have you ordered and used the Test Item Matrix Report?

_____Yes

_____No

If yes, please respond: The report provided _____information for making decisions regarding program content.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

23. Have you ordered and used the Objective Matrix Report?

_____Yes

_____No

If yes, please respond: The report provided _____information for making decisions regarding program content.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

24. Have you ordered and used the Student Record Display?

_____Yes

_____No

If yes, please respond: The report provided _____information for making decisions regarding student performance.

_____a. excellent

_____b. good

_____c. fair

_____d. poor

Comment

25. My personal understanding and use of the IMPACT system is _____.

_____a. high

_____b. average

_____c. low

Comment

26. What has been the most important advantage(s) to you in using the IMPACT system this year?

27. What changes would you recommend to make it work better for you next year?

THE EFFECTS OF A STUDENT ACHIEVEMENT INFORMATION SYSTEM ON STUDENT LEARNING

by

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Introduction

The development of the IMPACT system has occurred in stages over the past four years. The system has been designed as a series of interrelated modules consisting of a Master Curriculum File, a Norm Referenced Test Scoring and Analysis Module, a Criterion Referenced Test Scoring and Analysis Module, and a Student Achievement Historical File.

After each module, or component of the system, was completed to the satisfaction of the development team, it was then made available for use by local school personnel. The first component of the system to be completed was the Norm Referenced Test Scoring Module (NRT). For the past four years this component has been used to score standardized commercial tests, both abilities tests and achievement tests, for the school districts in Central New York. During this current school year, 1980-81, norm referenced tests have been scored for over 30 school districts.

The second module of the system to be completed and pilot tested was the Master Curriculum File (MCF). This file is a data bank of instructional objectives, criterion referenced measurement items and teaching-learning strategies called prescriptions. At this point in time, the MCF contains thousands of curricular elements primarily in the areas of reading and math. Teachers and curriculum supervisors from the pilot districts have utilized the information source to build their local course curricula.

The third component of the system to be completed to the stage of actual field testing was the Criterion Referenced Test Scoring Module (CRT). This current school year is the second full year of classroom implementation of this component in local school districts. Presently 43 local courses have been set up to use the CRT module for pupil and program monitoring. However, teachers of these courses have been following a diagnostic/prescriptive approach to

instruction using an objectives' based curriculum for the past two to three years. It is only recently that they have been utilizing the IMPACT Criterion Referenced Testing Module as an instructional management system.

The fourth major component of the system, which is in its final stages of development and testing, is the Student Achievement Historical File (SAHF). Though not completely developed yet, a three year history base of norm referenced test score data has been loaded into the file. The first actual test of the utility of this component occurred at the end of the 1979-80 school year when pre-post evaluation reports for students in categorically aided programs (e.g. Title I) were produced for state and federal reporting purposes.

This paper will focus upon the use by local school districts of two of these components, the MCF and the CRT module. Primary emphasis of this investigation was on the utility of the information reports provided by the CRT component in improving student learning. The general theoretical framework was that student learning is dependent to some degree on the instructional decisions made by classroom teachers and local school administrators. It is also hypothesized that instructional decisioning is influenced by the quantity, accuracy, and timeliness of the information available at relevant decision points. Thus, if more accurate, timely information is made available to instructional decision makers then the appropriateness of their decisions should increase and thus student learning should be positively affected.

The output reports of the CRT module provide teachers, at each test occasion: 1) an individual student report indicating the student's mastery status on each objective tested, 2) a class diagnostic report that groups all students in a class section by objective(s) they have failed to master, and 3) an item analysis of the test form used. At other intervals and upon specific request, local school personnel also receive a group summary report that indicates how all students in a course or teacher section are performing

on all course objectives at both pre and post instructional points in time. They can also obtain a year-to-date summary report for each pupil on their mastery status by individual course objective and including which teaching-learning prescriptions have been assigned. This study examined the student achievement results in reading in those pilot school classrooms that were utilizing these CRT reports.

Procedures

This assessment of Project IMPACT could best be characterized as a formative evaluation (Scrievn, 1967) as broadly interpreted by Bloom (1971). The project team has been, and is continuing to, collect information on the utility of the system, primarily for system revision and enhancement purposes. The ultimate aim, of course, is to provide a management information support system that will improve educational decision making and thus the achievement of students. However, sufficient implementation of the system in terms of length of time and extent of use has not yet occurred which would provide the basis for a summative evaluation from which judgements can be made.

School administrators in two of the pilot school districts gave their permission to use the student achievement data that have been stored in the course files in the IMPACT System for the past two years. At the point in time data were analyzed, one and a half years of student achievement data had been accumulated in the files. The analysis technique chosen was to determine the average achievement gain in the number of instructional objectives mastered by the students enrolled in those courses during those school years. Since data from only the first semester of the 1980-81 school year were available at the time of analysis, data from only the first semester of the

1979-80 school year were used from that year. Thus, the 1st semester data from two consecutive school years has been summarized for comparative analysis.

It was not possible to obtain data from a similar group of students who were not involved in the pilot test classrooms to serve as a control group. Therefore, an experimental-control design could not be employed. In the second year, both districts chose to involve their entire elementary school program precluding any possibility for establishing control groups.

Results

Preliminary results regarding the effects of the instructional management system on student achievement are based upon the data summarized in Tables 1 and 2. Student gains in skill mastery for 329 students in eleven courses piloted during the 1979-80 school year are reported in Table 1 and achievement gains for 915 students during the first semester of the 1980-81 school year are summarized in Table 2.

The average percent mastery was the total number of objectives mastered by all students at a grade level out of the possible all students mastering all objectives. The last column of the two Tables indicates the number and percentage of students mastering at least 50% of the objectives in the course. Fifty percent of the course objectives was chosen as the assessment criterion since the data represented one-half of the school year and it could be reasonably assumed the students should have mastered approximately one-half of the course objectives. There was, of course, much variance in the actual percentage of mastery from one student to another, some mastering almost the entire course content while others had only demonstrated mastery on a few course objectives. This within course variance in achievement, accounts for the differences in the data reported in the Average Percents of Objectives Mastered column.

Table 1
Student Achievement Results
Reading Skill Mastery Gain by Course and Level
First Semester 1979-80

GRADE LEVEL	NUMBER OF COURSES	NUMBER OF STUDENTS ENROLLED	AVERAGE PERCENTAGE OF OBJECTIVES MASTERED	NUMBER OF (PERCENT) STUDENTS MASTERING 50% OR MORE OF OBJECTIVES - FIRST SEMESTER 1979-80
1	1	21	55%	18 (86)
2	2	41	80%	28 (68)
3	1	23	51%	9 (39)
4	2	50	52%	29 (58)
5	2	69	44%	44 (64)
6	2	87	77%	78 (90)
8	1	38	44%	13 (34)
		329		

Table 2
Student Achievement Results
Reading Skill Mastery Gain by Course and Level
First Semester 1980-81

GRADE LEVEL	NUMBER OF COURSES	NUMBER OF STUDENTS ENROLLED	AVERAGE PERCENTAGE OF OBJECTIVES MASTERED	NUMBER OF (PERCENT) STUDENTS MASTERING 50% OR MORE OF OBJECTIVES - FIRST SEMESTER 1980-81
1	2	180	77%	127 (71)
2	2	178	79%	160 (90)
3	1	55	70%	49 (89)
4	1	54	51%	32 (59)
5	2	97	60%	67 (69)
6	3	196	70%	179 (91)
7	1	74	71%	57 (77)
8	1	81	71%	73 (90)

The first year data show wide variance between grade level courses on the average percent of objectives mastered. Some were quite high, over 70% for one semester of instruction while two fell under the minimal criterion. In the second year there was a much higher average achievement gain with all levels exceeding the minimum criteria. Most courses were in the 70% mastery level by the end of the first semester.

Conclusions

The lack of methodological rigor in terms of a classical research design precludes making definitive conclusions about the effectiveness of the IMPACT System in increasing student achievement. Using data that was available on students involved in the pilot test of the CRT component as the sole basis for assessing its effectiveness does not account for many important variables that contribute to student achievement. This preliminary evidence, however, is in the direction of supporting the main contention that when school personnel are provided frequent systematic evaluation information on student progress there will be an increase in student achievement.

Comparing the first semester results of two years of implementing the CRT module of IMPACT shows an increase in the average percent of course objectives mastered by the students in the second year over the first year at most grade levels. It would appear that as school personnel gain greater familiarity with, and understanding of, the information provided by the system their use of it has a positive effect upon student learning. Schultz, in her study of teachers' adaptation to innovations, found that some teachers reported that it took four years to get acclimated to using periodic testing and a computer system (Schultz). And, as Howland's paper indicates, teachers who had specific training

and a high level of understanding in the IMPACT System found the information much more useful for instructional decisioning.

However, this improvement in the mastery of course objectives could be due, in part, to the nature of the skills selected to be taught and/or changes in pupil characteristics from the first year to the second. Regarding the latter issue, the school districts were the same ones serving the same student populations in the second as in the first year. There were twice as many teacher sections involved the second year as the first and that indicates that approximately half of the students were in the pilot program for two years. This segment of the student population involved would have had a year's experience in the system and could conceivably have benefited from knowledge of the new instructional process. If indeed this is the case, then the System contributes in another way, directly upon the students themselves, to improving achievement.

Since teachers originally selected the objectives for their courses from the MCF, it is possible that they are either overestimating the difficulty level of the objectives or underestimated the capability of the student they were to teach in the first year. Between the first and second year of pilot testing, many of the teachers spent a few weeks revising the objectives, prescriptions, and measurement items they would use the second year. Thus, a more realistic curriculum in terms of difficulty level may have been used in the second year, contributing to a higher achievement level. This probable situation also would substantiate the use of the IMPACT system for improving instructional program decisions, which in turn increases the likelihood of having a curriculum that provides students realistic opportunities for achievement.

Finally, whether the information provided by the computer based achievement information system did directly contribute to improved student achievement

through improved instructional decisioning by educators using the system or not, it does provide an information base that can be used for instructional decisioning. The fact that the system does provide for achievement record keeping and periodic reporting on individual student progress as well as summative data on program effectiveness means that the information is now readily accessable to those who choose to use it for those purposes. This information support capability has been the primary development objective of the project and its developers and pilot test users believe that objective has been met. Its complete utilization for instructional decisioning rests more with those who are to use it on a regular basis than the nature of the software system itself. This implies that greater attention in the future must be given to staff training and implementation strategies than computer system design and development. Hopefully, in the future these aspects will become the focus of evaluation and research.

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